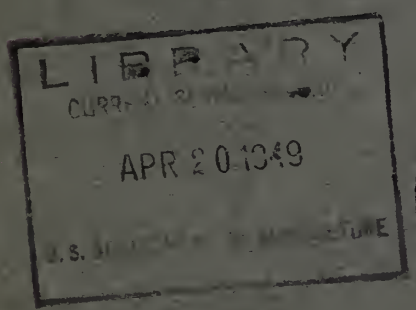
# Agricultural Economics RESEARCH





*Contents for* APRIL 1949 — *Vol.* I, *No.* 2



UNITED STATES DEPARTMENT OF AGRICULTURE • Bureau of Agricultural Economics

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price 20 cents

# Contributors

*Contributors are on the staff of the Bureau of Agricultural Economics unless otherwise stated*

Emerson M. Brooks worked in three field offices of Agricultural Estimates before coming to Washington. He has had a part in planning and putting through the enumerative surveys made by BAE since 1942 and he supervised the first interview survey of farmers made by the Military Government in the U. S. Zone of Occupation in Germany.

Donald E. Church is in charge of transportation research in the Marketing and Transportation Research Division. Before joining the Bureau, he was engaged in transportation research for other governmental agencies, business research for private industry, and teaching.

Walter A. Hendricks, after 22 years in experimental statistics and sampling and estimating methods, is now research methodologist in Agricultural Estimates. He headed the BAE research office cooperating with the University of North Carolina, taught courses in sampling, least square theory, and biological statistics and, with Paul Koenig, in Germany, helped to organize and analyze crop surveys for estimating 1948 crop production.

Neil W. Johnson, while assistant head of the Division of Farm Management and Costs, has been engaged in agricultural production adjustment and related studies. He is now Special Assistant to the Administrator of the Agricultural Research Administration to head up the work in the Department's new Central Project Office.

Charles F. Sarle spent 3 months in Japan evaluating the accuracy and timeliness of crop estimates and the efficiency of methods used by the new Japanese Crop Reporting Service. He is Head of the Division of Special Farm Statistics in Agricultural Estimates.

Edmund deS. Brunner is Professor of Rural Sociology at Teachers College, Columbia University. He pioneered in rural social research and has made outstanding contributions on the agricultural village and rural social trends. His most widely used book is the text *A Study of Rural Society.*

Donald C. Horton returned last year to full-time duty as head of mortgage research in the Division of Agricultural Finance after 2 years on a cooperative project with the National Bureau of Economic Research, Inc. From time to time he gives courses at American University in money and banking, international economics, and economic theory.

M. L. Wilson is the widely known Director of the Extension Service.

Kenneth L. Bachman is leader of the farm classification and analysis work in the Division of Farm Management and Costs. Previous to his year of advanced study at Harvard, his research had been mainly on Southern agriculture.

Editors: Howard L. Parsons
Caroline Sherman

AGRICULTURAL ECONOMICS RESEARCH

A Journal of Economic and Statistical Research in the
Bureau of Agricultural Economics and Cooperating Agencies

Volume 1 APRIL 1949 Number 2

# A Report on the General Enumerative Surveys—I

By Emerson M. Brooks

*Statisticians are constantly trying to make their methods more precise, not only because of their scientific interest but also to meet the ever-increasing load which modern society throws upon statistical measurement. A notable contribution has been made over the last dozen years by means of the adaptation of probability sampling, along with the interview-type schedule, to agriculture and the development of the so-called master sample materials through the cooperative efforts of the Bureau of Agricultural Economics, the Bureau of the Census, and the Statistical Laboratory of Iowa State College. Ironically enough, the Bureau of Agricultural Economics has not been able to make very wide use of these new methods since the added precision means added cost.*

*We were able, however, to arrange for two general Nation-wide enumerative surveys, both covering items which could not readily be obtained by mailed inquiry. The field work for the first of these was carried forward in January 1947 and for the second in April 1948. The scheduled items were arrived at through Bureau-wide discussion, and the surveys were jointly financed from economic research and agricultural estimates funds, with costs divided between the two on the basis of the number and character of questions asked. In addition, the second survey carried a section on marketing channels and transportation methods financed from an allotment under the Research and Marketing Act. An article based on these data is carried in this issue of the journal.*

*Questions are raised from time to time, and properly so, as to what was done and the results obtained. This is the first of two articles designed to answer such questions. That is, the Division of Special Farm Statistics has been asked for a report written in the form of two related articles, the first describing and to some extent evaluating the mechanics of developing and carrying forward the surveys and the second dealing with the data themselves, how they are being used or where they are published. It should be understood that these articles are not designed either as an outline as to how to carry forward an enumerative survey or as a discussion of the merits or demerits of the enumerative versus other statistical methods. Some light should be thrown on both of these questions, however, by an actual examination of how the surveys were run, of their costs, and the results obtained.*

*In conclusion, attention is called to one final factor: No attempt is made to evaluate the experience gained, especially by those actually in charge of survey operations, in the States and in Washington. But certainly, the Bureau statisticians are now much better qualified to do enumerative survey work and to discuss plans for the future, including the task immediately ahead of advising on the Census of Agriculture for 1950.—O. V. Wells*

TO obtain broader and more adequate coverage of economic information, the Bureau of Agricultural Economics has made two large-scale Nation-wide enumerative surveys. The first of these, in January 1947, included interviews with 14,468 farmers in a scientifically selected sample of 814 counties. Figure 1 indicates the distribution of the counties. Some 450 local people were hired and trained to do the interviewing. Usually each had two counties in which to work, the home county and another some distance away. In each county, four or five areas of land, or sample segments, had been selected and interviews were obtained with all farm operators whose farm headquarters were inside the boundaries of a segment.

There were two questionnaires. The "short" one, covering 9 topics, required an average of 57 minutes per interview. It was used on 10,268 farms. The "long" schedule included four additional subjects and its interview required 99 minutes. It was used in interviews with 4,200 farm operators.

The short questionnaire dealt with these problems:

A. Accidents to farm people
B. Farm acreage
C. Prices of farms
D. Farm population
E. Farm employment and wages
F. Livestock numbers
G. Farm tractors
H. Crops on hand
I. Value of farm products sold

The additional topics in the long schedule were:

J. Farm expenses
K. Family living expenses
L. Other income of members of household
M. Operator's dwelling facilities

It was intended originally that only the long questionnaire would be used but considerations of cost made it necessary to utilize a shorter inquiry for the farms in about 70 percent of the segments. There were some exceptions, notably

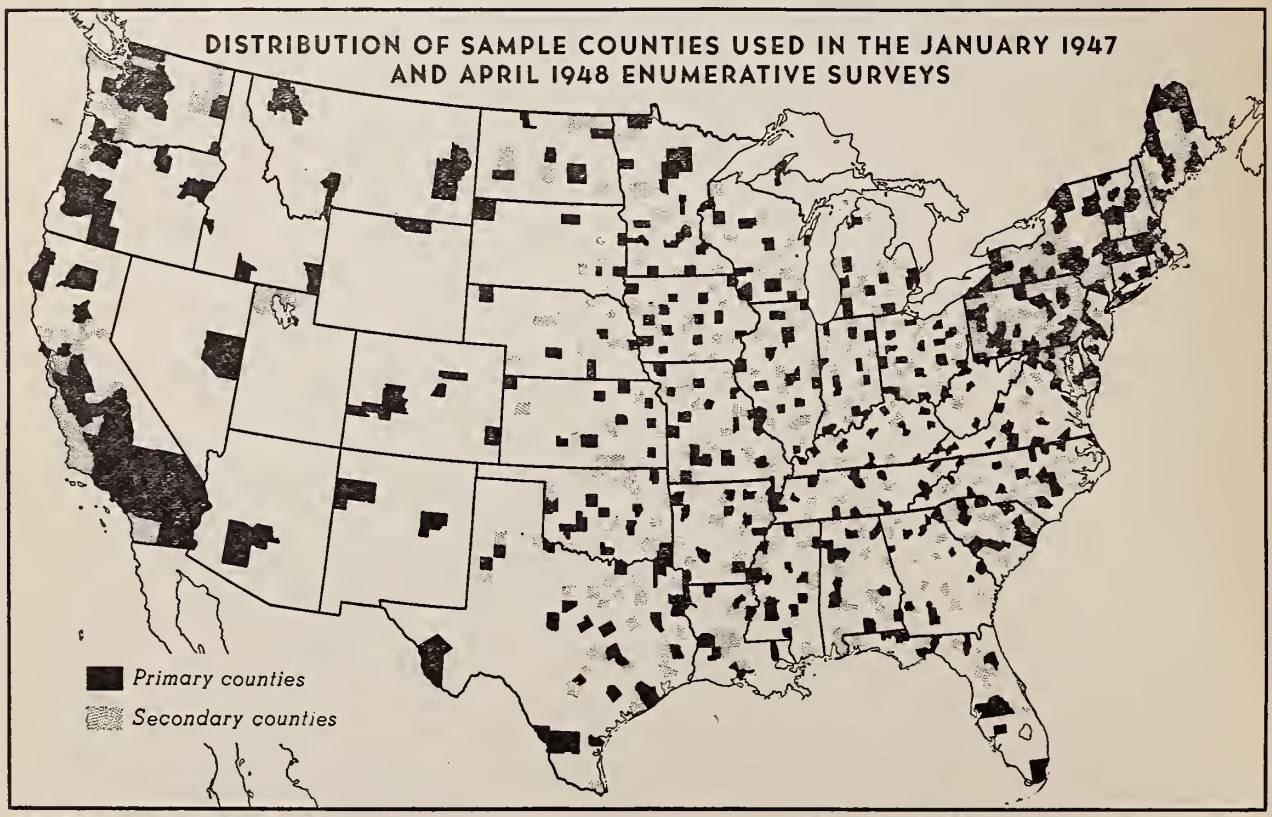



FIGURE 1.

in Illinois, where other research made it essential that data on farm and family living expenses, other income of members of the household, and operator's dwelling facilities, be obtained regarding all farms in the sample.

The second enumerative survey, which obtained 11,395 interviews, was made in April 1948 in the same 814 counties used for the January 1947 survey but in different areas within each county. Fifteen topics were included in this survey:

A. Farm acreage and tenure
B. Tenure practices
C. Grain and hay stocks and 1947 grain production
D. Crop acreages
E. Livestock and poultry
F. Farm power and machinery
G. Financing of farm machinery and equipment
H. Farm population and family employment
I. Hired farm employment and wages, week ended April 24, 1948
J. Accidents to people living or working on this farm
K. Sickness of farm operator
L. Fire damage
M. Marketing channels and transportation methods
N. Farm construction
O. Commercial fertilizer

A third enumerative survey was made in September 1948 but, because of budgetary limitations, it was restricted to information on two subjects—farm employment and wages and accidents to people living or working on farms. Interviews were obtained on 9,883 farms in 427 of the counties used for the two previous Nation-wide surveys.

These surveys obtained information on a wide range of subjects and concerning matters for which heretofore there had been little, if any, factual information. For example, the data on farm accidents and on marketing channels and transportation methods are unique in their fields.

## Planning of a Nation-wide Enumerative Survey

An enumerative survey can be likened to a four-legged table. One "leg" is the design and plan of the sample, a second is the structure of the questionnaire, a third is the work of the interviewer, and a fourth is the analysis of the data. It follows that if any one of these legs is weak the table will not be serviceable. As there are more than 5 million farms in the United States and only 10,000 or 15,000 of them are included in a sample, an enumerative survey must be a precision instrument. This means that every phase of the project must be carefully planned and faithfully executed. The initial decisions include a determination of the budget, the approximate number of farms to be visited, the number of counties to be included in the sample, and the approximate date the survey is to be made. Once these decisions have been reached, an enumerative survey goes through some 16 stages:

1. Determination of subject matter to be included in the survey
2. Design and drawing of the sample
3. Preparation of timetable of operations
4. Design and construction of questionnaire
5. Pretest of schedule and procedures in the field
6. Preparation of instructions to interviewers
7. Duplication of schedules, instructions, operational forms, etc.
8. Distribution of material to field
9. Training of State supervisors
10. Locating and hiring interviewers
11. Training of interviewers
12. Interviewing, including supervision of interviewers
13. Editing and coding of schedules
14. Tabulation and summarization of data
15. Analysis of data and expansion of the sample
16. Publication of results

## Determination of Subject Matter To Be Included in a Survey

Requests for inclusion of topics in these surveys were voluminous. To reduce them to manageable proportions, six questions were raised concerning each proposal:

1. What is needed?
2. How frequently is it needed?
3. When during the year is the best time to obtain the information?
4. Why is it needed; that is, for what will it be used?
5. How will farmers and the national economy benefit either directly or indirectly?
6. What are the tabulation plans?

This information was needed not only to determine the subjects to be included but also in deciding on the size and type of sample, in drafting the questionnaire, in planning operations, and in training the field organization.

When the schedule topics for the January survey had been decided upon by the Chief of the Bureau and a draft of the schedule submitted to

the Budget Bureau for approval, that agency pointed out that it would not be desirable for BAE to make an income survey in January and the Bureau of the Census make an income survey in April. At conferences it was agreed that sections would be added to the BAE schedule on "other income of members of the household" and on "operator's dwelling facilities," and the Census Bureau in its April survey would not get income information from households containing a farm operator.

### Design of and Drawing of the Sample

For these surveys, an area sample has been used, that is, interviewers have visited all the farms that have "headquarters" inside the boundaries of selected segments in a specified number of counties. The first step in drawing the sample, therefore, was to decide on the number of counties to be included and their method of selection. For the January 1947 and April 1948 surveys, 814 counties were used. Briefly, the sample of counties was selected by dividing all the counties in the United States into 408 groups or strata on the basis of the most recent BAE generalized type of farming areas, with about an equal number of sample farms in each group. Each State was handled independently except for those in the Mountain States and the New England States. Usually a group was divided into approximately equal parts and one county was selected for each at random, with probabilities proportional to their number of farms.

The second phase in drawing the sample was in the selection of segments within the sample counties. For this purpose the master sample segments were utilized but as there are some 60,000 of these and only about 4,000 segments were needed, a random selection of the desired number was made in each county.

The third and final process in the determination of the sample was the selection of the farms within the segments. To give each farm an equal chance of being in the sample, it was necessary to specify a single point or place for use in making this determination. This was referred to as the farm headquarters and if it was inside the boundaries of a sample segment an interview was to be obtained. The interviewers were provided with county maps showing the location of the sample segments and with aerial photographs on which they traced the boundaries of each tract of land inside the segments; they then established by specific rules the headquarters of each farm that had any land inside the segment. If the farm operator lived on his farm his residence was the headquarters but if he did not live on his farm one of the following places, in the order given, was considered to be the farm headquarters:

1. A dwelling either occupied or unoccupied
2. A building
3. The main entrance to the farm
4. The northwest corner

It will be seen that every county and every segment or area of land—hence every farm— had a chance of being in the sample regardless of its size or type of agriculture. This procedure is believed to be statistically sound and in operation it can be applied to the field with satisfactory results.

In the January survey about one-third of the segments were designated for a complete clean-up; that is, the interviewers were to make a resolute effort to get an interview with every eligible farm operator in these segments. The theory was that the data obtained by a complete coverage of farms in about one-third of the segments would provide a basis for estimating the bias for incomplete enumeration of the remaining segments.

This procedure did not work as well as expected because of an inability to get 100 percent coverage in the clean-up segments so it was not used in later surveys. Moreover, the cost was rather high because of the excessive time-and-mileage expense in making the numerous call-backs in the clean-up segments.

For the April survey the same counties were used so that as many of the previous interviewers as seemed desirable could be re-hired but new segments were selected in order to avoid over burdening respondents and to provide additional names for later mailed inquiries.

In addition to the area sample the so-called large farms were handled separately in the 17 Western States for the April and September 1948 surveys. These farms are so large or their operations of such magnitude that it was considered necessary to devise a separate sample for them, in the case of the Western States where the area sample was rather small. A list of farms in the West meeting the 1945 Census criteria for large farms was sampled at the rate of 0.02; and to

these were added any farms obtained by the area sample which satisfied the large-farm criteria.

The Census definition of a farm was used in the enumerative surveys as the sample was stratified on this basis and data for "census farms" were needed in expanding the sample data, analyzing the results, writing the report, and, on the part of the general public, in interpreting the published material. A census farm essentially is all the land handled as a unit on which a person carries on agricultural operations with the aid of his family and hired workers, provided his place consists of 3 acres or more, or the value of production the previous year amounted to $250 or more. This concept of a farm is rather complex and is difficult to apply in field operations but it is the best available and it does have the virtue of long use and general acceptance.

It is apparent that the sampling procedure was involved and that the interviewers had to do their job well if the results were to be satisfactory. Their success in identification of sample farms as compared with the expected number of farms in the segments based on Census data and in obtaining interviews for eligible farms is indicated in table 1.

TABLE 1.—*Expected number of farms compared with number of farms identified and number of interviews completed*

| Item | Jan. 1947 survey | Apr. 1948 survey | Sept. 1948 survey |
|---|---|---|---|
| | *Number* | *Number* | *Number* |
| Expected farms [1] | 19, 756 | 12, 917 | [2] 7, 815 |
| Farms identified | 17, 704 | 12, 563 | 7, 165 |
| Interviews completed | 14, 468 | 11, 395 | 6, 666 |
| | *Percent* | *Percent* | *Percent* |
| Identified as percentage of expected | 89 | 97 | 92 |
| Interviews as percentage of identified | 82 | 91 | 93 |

[1] Based on 1945 census count for sample segments.
[2] A total of 9,883 interviews was obtained; the 7,815 represents those in segments used for the first time.

The relatively low figures for the January 1947 survey compared with those for the April survey were due to many factors. Supervisors as well as enumerators were inexperienced. The weather was severe, roads were bad, and many farmers could not be reached because, as usual, they were not on their farms during the winter. There were 73 segments that could not be reached at all because of excessive snow or prolonged floods. It has been estimated that under average conditions there are 500,000 farms in the United States that cannot be visited during the winter because of impassable roads. In planning the date of a farm survey this should be given definite consideration.

Data in the table show that only 92 percent of the "expected" number of farms were identified in the new segments used in September, compared with 97 percent in April. It is believed that the reason for the decrease is that training schools for interviewers were not held in September, at which the importance of farm identification would have been stressed. Moreover, the interviewers were not given the close supervision during the survey that they had been given in April.

Although the field procedure was difficult it appears that part-time interviewers can grasp the essentials of area sampling and can do the work satisfactorily if they have adequate supervision during the early stages of the survey.

## Preparation of a Timetable of Operations

It is difficult to prepare a timetable of work to be done that can be adhered to strictly but the effort must be made or the whole project may bog down. On August 20, 1946, the following timetable was agreed upon for the survey that was to be made in January.

| *Schedule preparation* | *Dates* |
|---|---|
| 1. Initial draft of questionnaire | Aug. 20 to Sept. 2 |
| 2. Clearance of pretest schedule within BAE and the Budget Bureau | Sept. 3 to Oct. 3 |
| 3. Pretest in Pennsylvania and South Carolina | Oct. 4–14 |
| 4. Redraft for submission to Budget Bureau | Oct. 15–17 |
| 5. Clearance of final questionnaire with Budget Bureau | Oct. 18–24 |
| 6. Reproduction of schedules | Oct. 25 to Nov. 10 |
| 7. Schedules to be mailed to field not later than | Dec. 1 |

This was a tight schedule—too tight as it turned out. Delays resulted primarily from the frequent changes in the questionnaire, especially the inclusion of the Census Bureau income section referred to previously. According to the timetable the questionnaires were to be mailed to the field not later than December 1. This date was decided upon in order to get the large volume of material in the mail ahead of the Christmas rush, to have the supplies in the hands of the State people in time for them to arrange it for distribution well in

advance of the State meetings, and so that those States that would hold training schools before Christmas would have the supplies for this purpose. Actually the final schedules were not mailed until December 19, 20, and 23. Such delays throw an unnecessary burden on the whole organization, especially the field staff. If at all possible they should be avoided. The timetable for the April survey did not involve quite as many days as that for January. Lessons learned in operating the January survey made it possible to expedite the drafting of the questionnaire and organization of the work for the April survey.

## Design of Questionnaires

Questionnaires or schedules of varying shapes and sizes were considered for the enumerative surveys but the decision to use a pamphlet type with pages 8 by 10½ inches seems to have been sound. A schedule of this kind is easy to handle and does not appear formidable. Holes were punched in the left margin of the schedules so that they could be placed in cloth-bound ring notebooks for the convenience of the interviewers. The notebooks provided a neat and orderly way to keep the schedules during the field work, gave a solid back to support the schedule when the interview was taken in the open or in a car, and protected the schedules from rain or snow and general mutilation. The use of sheets of this size is also of real advantage when the numerous drafts of each page or section are made during the preparation of the schedule, as they can be used in any typewriter of ordinary size.

Two general types of questionnaires are used for enumerative surveys, the "record type" and the "interview type." In the record type the questions are indicated but not wholly stated. In the interview type, each question is stated in full and exactly as the interviewer is to ask it. Experience in these surveys indicates that best results are obtained with an "interview type" questionnaire. A well-designed questionnaire simplifies and speeds up the interviewing as well as the editing, coding, tabulation, and analysis.

Considerable attention was given to the psychological aspects of the phraseology used. Every effort was made to couch the questions in the simplest language and the fewest words possible and in terms readily understood by farmers.

In the questionnaire used in the January 1947 survey a short concise statement concerning the information to be asked for and the need for obtaining the data was placed at the head of each section of the schedule. It was intended that the interviewer should use these when proceeding from one subject to another. Probably many did not do this, but the theory was that the information was there for them to refer to quickly if a respondent raised questions as to why the data were wanted or how they would be used. Such statements must be extremely brief, yet informative and conversational in tone; otherwise they may sound like a stump speech and irritate the respondent who wants to hurry along and finish the interview.

These introductory statements were omitted from later questionnaires but the interviewers were given definite instruction at the training school concerning the need for the collection of the data in each section of the schedule and a carefully prepared statement concerning the purpose and use of each topic was included in the detailed instructions for each survey.

One of the techniques used in designing the questionnaires that has proved very useful is the use of "screening questions" to which the respondent answers Yes or No; if the answer is No the interviewer passes over several questions which do not then apply in that particular interview.

Following are some do's and don'ts in the construction of schedules based on experience with these surveys:

1. Use short questions, each with only one objective.
2. Use clear and simple terms.
3. Avoid questions that refer to periods too long for recollection.
4. Avoid asking for percentages if absolute numbers can be obtained.
5. Keep the average interviewing time under an hour.
6. Use the best paper that can be afforded.
7. Use printed schedules and large print.
8. Provide adequate space for recording answers.
9. Leave ample margins for interviewers' notes.

## Pretest of Questionnaire and Procedures

No questionnaire can be considered ready for use in a survey until it has been tested, together with the field procedures, under conditions approximating the actual survey situation. The January questionnaire was tried out in Maryland, Virginia, Pennsylvania, and South Carolina before it was considered ready for the printer. Additional tests should have been made in other parts of the South, and in the Corn Belt, and the Mountain and Pacific States, because of variations in

farming practices and terminology, but this deficiency was partially offset by suggestions made by the State supervisors at the area training schools which were included in the final draft.

The questionnaire used for the April survey was pretested in Indiana, extensively in the South, but not at all in the West because of time limitations and the distances involved. This was unfortunate as there are problems in those States, such as the proper handling of publicly owned grazing land, which are troublesome. However, this situation is so complex that a brief study of it during a pretest probably would not be adequate to develop new procedures. The April questionnaire was printed in time for use at the area schools so changes based on the criticisms of the State supervisor could not be made.

The pretests were carefully planned giving special attention to these factors:

1. *Location*—counties were chosen which would provide tests of particular problems.
2. *Personnel*—included a subject-matter specialist, a sampling expert, an analyst, an operations man, a State supervisor, and a number of typical interviewers.
3. *Supplies*—included maps, aerial photos, schedules, instructions, field forms, etc., that were used in the full-scale enumerations.
4. *Interviewing*—included both single and double interviewing. Double interviewing means having one person do the interviewing while another observes and makes notes concerning any phase of the questionnaire or the interviewing.

One of the complex situations with which interviewers have had to deal is that of "multiple-unit" farms, or farms with croppers, in the South. In actual practice these are, for the most part, simply large farms on which the work is done by individuals or croppers who receive a share of the crop and various perquisites in lieu of wages. But because it has been customary census procedure to consider the croppers as independent farmers it is difficult to devise a way that will obtain information for the multiple-unit as a whole and yet have the information on the cropper operations in a form that will permit them to be segregated and treated as information from separate farms would be. To illustrate:

| | *acres* |
|---|---|
| Suppose that John Jones owns | 1,000 |
| and that he rents from others | 500 |
| Making a total of | 1,500 |
| Of this he rents out to two bona fide renters | 200 |
| Leaving him to operate with his family, hired workers, and croppers | 1,300 |
| Of this 1,300 acres 50 croppers have | 500 |
| Leaving him to operate with his family and hired workers | 800 |

According to the Census definition the total 1,500 acres consist of 53 farms, or 53 farm operators: the two bona fide renters, the 50 croppers, and John Jones who is considered the operator of the "home farm" of 800 acres. In practice, however, the specified 1,300 acres is usually operated as one farm with Mr. Jones making the decisions as to what to plant, when to plant, when to cultivate, when to harvest, and when to sell. Opinions differ as to what should be considered the "farm" for enumerative purposes. Some think the entire 1,500 acres should be considered the "farm"; others think it is the 1,300 acres; still others prefer the 53-farm idea.

In the January 1947 survey the headquarters of the 1,300-acre unit was decided upon and if the "headquarters" was inside a sample segment a schedule was obtained from Mr. Jones for the 800-acre home farm and for a sample of the 50 croppers. This meant that croppers living inside a segment who were not associated with a multiple-unit with its headquarters inside a segment were *not* interviewed; conversely croppers living outside a sample segment who were associated with a multiple-unit *with* headquarters inside a segment *were* interviewed. This was a confusing procedure to explain to interviewers and for them to apply in the field.

Before the April survey extensive pretests were made in North Carolina, Alabama, Mississippi, and Texas, in cooperation with the Census Bureau, to develop, if possible, a simpler procedure for enumerating multiple-unit farms. Two problems were involved: (1) how the Census Bureau should handle the problem when making an enumeration of all farms and (2) how the problem should be handled in a sample survey.

So far as the April enumerative survey was concerned the decisions made and the reasons for them are as follows:

1. Interviewers were to be instructed to obtain a complete schedule for all "Census" farms with headquarters inside a sample segment.
2. When the headquarters of a multiple-unit was inside a segment (a) a schedule was to be obtained from the operator for the land that he operated with his family and hired workers. It was assumed that this "farm" would be the same as the so-called "home farm," (b) no schedules were to be obtained for any subunits whose individual headquarters were *outside* the segment, and (c) no attempt was to be made to obtain information on a multiple-unit basis.

The following factors were among those considered in arriving at these recommendations: (1)

Data for "census farms" are needed in expanding the sample data, analyzing the results, writing the report and, on the part of the general public, in interpreting the published material. (2) The sample was drawn on the basis of number of census farms, and probably will be so drawn for future surveys. (3) The number of multiple-units included in a national sample of 11,000 farms probably would not exceed 200 or 225—too few to make possible a presentation of multiple-unit data. (4) The proposed procedure would obtain data that more nearly represented the actual sample segments than any of the alternative procedures. (5) The recommended procedure probably would be easier to apply in the field than any others that had been considered.

## Instructions to Interviewers and Distribution of Material to the Field

Instructions and explanatory material for the use of interviewers in these surveys were prepared in two parts. A Training Manual was prepared to give the interviewers a general knowledge of survey procedures; it included a discussion in layman's language of the theory of sampling, interviewing techniques, and related matters.

The other publication was a pamphlet called Instructions to Interviewers which contained detailed instructions concerning the interviewers' work for the specific survey. The Instructions to Interviewers was set up in logical sequence to enable the supervisor, when training interviewers, to start on the first page and continue through the pamphlet, taking up each step of the field work in the order in which it would be done during the survey. The Training Manual and the Instructions to Interviewers had covers of different colors for quick identification.

Questionnaires were printed and other forms were mimeographed, although printing is preferred as it is easier to read and stands up better under frequent handling.

A large-scale enumerative survey requires careful distribution of many forms of various kinds. For the January 1947 survey, for example, some 98,000 pieces of material of 34 different kinds were mailed to the 41 State offices. Because of the variation in number of farms, sample counties, and interviewers per State, the number of copies of each of the 34 items going to each office had to be predetermined and then carefully counted for distribution. In addition, 500 kits, each containing a complete set of the schedules, forms, instructions, etc., were prepared and mailed to field offices for the use of the interviewers in the training schools.

The most important point in regard to the distribution of supplies is to get them to the field well in advance of the survey so the State supervisor can organize them for distribution to the interviewers throughout his State. The materials should be in the State office 3 or 4 weeks before the date the interviewing is to begin. This enables the State supervisor to coordinate the assembly and distribution of the supplies with his other work and field travel. Successful timing was achieved for the April and September surveys.

## Training State Supervisors

The Statisticians in Charge of the 41 field offices had the full responsibility of all phases of the enumerative-survey projects in their respective States. It was recognized, however, that in most instances they would not have the time necessary to do the "leg work" involved in locating, hiring, training, and supervising the interviewers, so one of the younger statisticians in each office (usually rated as a P–3) served as State Supervisor and was given special training in the details of the projects. For the January and April surveys area training schools for the State supervisors were held in Columbus, Ohio; Salt Lake City, Utah; and Montgomery, Ala. The 1947 area training school lasted 5 days and the one in 1948, 3 days. Because the subject matter and field procedures for the September 1948 survey were similar to those of the April survey no area schools for supervisors were held before the fall survey.

The program for the 1947 area schools for supervisors was planned in detail to cover the necessary material during the 5-day conference. The first day was devoted to survey methods, techniques in establishing rapport, use of maps and aerial photographs, the scope and objectives of the January survey, and discussion of the highlights of the schedule and the instructions to interviewers.

The second day the class was divided into two groups, one of which made recorded interviews that were played back so that any weaknesses in interviewing techniques could be detected, while

the other group went into the field to take practice interviews with actual farmers.

The third day had the same program except that the work of the two groups was reversed.

The fourth day was devoted to discussion of the recorded interviews, the experiences with the practice interviews in the field, and the details of the sample design.

The fifth day was used in explaining the methods of expanding the sample data; editing, coding, and machine tabulation of the schedules; hiring procedures; and a review of the job to be done in each State.

At the area schools an attempt was made to distinguish between the things they needed to know and the things they needed to understand. For example, a supervisor needs to know the salary rate of interviewers but that can be given to them in a table; on the other hand, what constitutes a farm headquarters is a matter that requires an understanding of basic principles and hence requires much more discussion and consideration.

The use of recorded interviews as a device in training supervisors who have had limited experience in interviewing appears to be worth while but probably would not be worth the trouble and expense when experienced supervisors are involved. There is, of course, no substitute for actual interviewing experience in the field. It should be a part of every training school.

The area training schools are an indispensable part of every Nation-wide survey unless the subject matter and field procedures have been used in a recent survey and are familiar to the supervisors. In April, greater emphasis was given to reasons for making the particular survey, how the results would be used, and how farmers and the general public would benefit from the survey. More time was devoted to farm identification and especially to the importance of obtaining interviews for small farms, and to the editing and coding of the completed questionnaires. By having the supervisors study the instructions carefully and take practice interviews before coming to the conference the training period can be reduced to 3 days, as was done for the April survey.

### Locating and Hiring Interviewers

Interviewers can make or break a survey not only from the viewpoint of public reaction but also with respect to the adequacy of the data that are collected. The sample may be statistically perfect, the questionnaire well designed, and the analyses skillfully made, but if the interviewers have done a poor job the results of the survey will not be satisfactory. This makes the task of the State supervisors in locating and hiring interviewers especially important. Usually in these surveys the supervisor sent letters to representatives of State and Federal agencies or others in the sample counties, giving information about the forthcoming survey and asking for recommendations of people who would make good interviewers. The supervisor then made a trip through the State interviewing the people who had been recommended and searching out others who were needed. Copies of the questionnaire and instructions were left with prospective interviewers for study and practice before they attended a training school.

For the January survey about half of the interviewers were recommended by county agents. Other sources of recommendations included the Field Service Branch of PMA, U. S. Employment Service, vocational agricultural teachers, colleges and universities, school superintendents, local business men, and other community leaders.

These local interviewers were paid on an hourly basis. Their ages, previous interviewing experience, educational background, and general qualifications varied widely. On analyzing the personnel forms for the 453 interviewers in January 1947 it was found that 91 percent were men, 60 percent were between 30 and 60 years old, 45 percent had been graduated from high school, 24 percent had attended college, and only 23 percent had interviewing experience.

A rating of the interviewers' work indicated that the type of person who makes the best interviewer in surveys of this kind is a farmer's daughter under 30 years old with a college education. This is not intended facetiously. A farmer's daughter has a knowledge of farm practices and terms that helps in interviewing; being young she can better stand the strains of the work; her college study aids her in grasping the objectives of the survey and the details of the procedure; and she has an advantage in gaining a courteous and helpful acceptance by the respondent.

### Training Interviewers

Training schools lasting 3 days were held in most States for the people hired to do the inter-

viewing in the January survey. Three days was little enough time to cover adequately the rather complex method of determining farms to be enumerated and to familiarize the interviewers with the long list of questions on the schedule, many of which were complicated. The training schools were carefully planned and the State offices were sent a detailed, hour-by-hour outline of the work and material to be covered.

Briefly, the purposes of the training school were these:

1. To make clear to the interviewer the importance of the work being undertaken.
2. To impress upon him his responsibility as an employee of the U. S. Department of Agriculture.
3. To give him a clear understanding of the Bureau's enumerative-survey program, why it is needed, and the basic concepts under which it operates.
4. To define his job—just what he was to do on the survey.
5. To train him in the skills necessary for a successful completion of his work including how to determine the farm operators to be interviewed, the purpose of each topic and question on the schedule, how to meet the respondent and establish rapport, how to introduce the topics on the schedule, how to probe to get more accurate replies, how to terminate the interview, and how to check the schedule for accuracy and completeness.

A combination of explanation, demonstration, and actual practice was used to accomplish these aims. About half the training period was spent in explanation and discussion of the program, the sample, the schedule, and the procedures in the field; the other half was used in demonstration interviews, in practice interviews, and in work in the field determining boundaries of segments, farm headquarters, and use of maps and aerial photographs.

On the final day of the training school the interviewers were given a quiz covering the major points of the survey. The replies brought out several points that needed clarification and the grades assigned indicated those interviewers who needed additional instruction and training.

It is desirable to keep the number of trainees at any one school to 10 or less in order that each interviewer be given adequate individual attention. Where there are only a few interviewers and they are located in different parts of the State "on-job" training was used; that is, the supervisor visited each interviewer and trained him in the work he was to do.

## Supervision of Interviewers

Close supervision of the interviewers during the survey is essential if best results are to be obtained.

At the close of the training schools for the January survey the State supervisors rated the interviewers somewhat as follows:

1. Good—requiring a minimum of supervision.
2. Average—requiring additional training and supervision during the first few days of the survey.
3. Fair—requiring substantial additional instruction and training; in some instances they were held over for an extra day of schooling.
4. Not usable—to be replaced.
5. Absentees—unable to attend; these were trained individually by the supervisor after the close of the schools.

On the basis of this classification the State supervisor laid out an itinerary that would enable him, or some other professional person, fully informed on the project, to visit the interviewers during the first few days of the survey.

During the week before the beginning of the April survey, the interviewers were instructed to take some practice interviews in their neighborhood. The supervisor then visited each interviewer, reviewed his work, answered questions, and corrected and explained any errors. This provided a last-minute check and a vehicle for supervision in addition to that given during the actual survey. Evidence found in table 1, on the identification of farms in sample segments and the number of interviews completed, demonstrates the value of comprehensive training.

## Processing of Questionnaires

After the termination of an interview the questionnaire was reviewed several times to discover omissions or errors that could be corrected. Enumerators were instructed to do this as soon as possible so that, if necessary, they could return to the respondent for additional information or correction of the data. When the questionnaires were received by the State supervisor he reviewed the schedules in detail, correcting or deleting faulty entries or returning the schedules to the interviewer for correction. When the questionnaires were received in Washington for machine tabulation they were again reviewed to detect possible discrepancies in the schedule entries and any variations in editing or interpretation by the supervisors in the different States. State supervisors had been provided with detailed editing instructions concerning each item on the schedule. The editing by the State supervisors is considered essential as they are familiar with local customs, practices, and terms. Having the editing done in the field offices distributed this work among

many people thus speeding up this phase of the project.

Coding of the survey data for machine tabulation was done in the field offices for the January survey, in accordance with detailed instructions. Later, when this work was reviewed in Washington it was found that so many of the problems had not, and in fact cannot, be anticipated that in later surveys the coding was done in Washington by a carefully trained and supervised staff. Even with the work centralized, it was found necessary to check all coding on the first 5 percent of schedules coded, and thereafter every tenth county coded by each person, to assure comparability. The punching and tabulating was done by the Bureau's machine tabulation unit.

## Punching and Machine Tabulation

Perhaps the most general criticism that has been made of enumerative surveys is that it takes too long to get the completed results. Delay has been due primarily to the lack of an adequate machine-tabulation unit. When plans were made for the January survey, it was anticipated that the machine unit could be so expanded that it could process the survey data within 3 or 4 months after the field work was completed. But funds were not available for immediately enlarging the unit so the punching was not completed until September and the tabulations until October. Somewhat the same situation influenced the processing of results of the April survey.

As different topics in the questionnaire were sponsored by different Divisions of BAE it was their responsibility to make the analyses and write the reports on those topics. But it is also necessary that the analyses be reviewed by one thoroughly familiar with the sampling procedure.

## Enumerative Survey Costs

Frequently questions are asked concerning the cost of an enumerative survey. Presumably it is recognized that any interview survey will cost more on a per schedule basis than a mailed survey with the same size of sample. It is necessary, therefore, to take into consideration the value of the kind of data obtained, the much greater information obtained, and the types of analyses that can be made that are not possible with returns from a mailed inquiry. In short, if enumerative surveys are to be worth the time and expense they must provide information that cannot be otherwise obtained for less money.

Two kinds of costs are involved in making BAE enumerative surveys. Those costs due to participation of regular personnel of the Bureau are called "absorbed" costs. Expenditures for supplies, travel, interviewer and clerical salaries and similar items, are called "out-of-pocket" costs.

Only out-of-pocket expenses are considered here and in table 2. For the January survey they amounted to an over-all average of $11.69 for the 14,468 interviews. The average cost per interview for salary, mileage, and per diem during the survey was $5.18. Comparable items for training interviewers averaged $1.76 per schedule. The 453 interviewers averaged 24.3 miles of travel per schedule and completed 2.6 schedules a day.

The April survey made in the same counties as were used in January, obtained 11,920 interviews at an average cost of $10.54. The cost of the 401 interviewers during the survey averaged $4.63 or 55 cents per schedule less than in the previous survey. With a questionnaire that called for an average of 53 minutes interviewing time the enumerators averaged 2.9 schedules a day and traveled 23 miles per interview.

The September survey was restricted to 427 counties; the interviewing time averaged only 33 minutes, and the travel per schedule averaged 16.9 miles. The total cost averaged $5.07 per interview; the cost during the survey averaged $3.36.

TABLE 2.—*Average "out-of-pocket" costs per interview*

| Item | Jan. 1947 survey | April 1948 survey | Sept. 1948 survey |
|---|---|---|---|
| | *Dollars* | *Dollars* | *Dollars* |
| Sample | 0. 11 | 0. 18 | 0. 04 |
| Pretest | . 07 | . 09 | ------- |
| Duplication of materials | . 18 | . 17 | . 12 |
| Supervisor schools | . 40 | . 31 | ------- |
| Hiring and on-job training | 1. 21 | . 65 | . 49 |
| Interviewer schools | 1. 93 | 1. 28 | . 25 |
| Pre-survey supervision | ------- | . 42 | ------- |
| Interviewing | 5. 18 | 4. 63 | 3. 36 |
| Processing interviews | 2. 47 | 2. 77 | . 76 |
| Other costs | . 14 | . 04 | . 05 |
| Total out-of-pocket costs | 11. 69 | 10. 54 | 5. 07 |
| Number of interviews | 14, 468 | 11, 395 | 9, 883 |
| Average interviewing time (minutes) | 69 | 53 | 33 |

The operational data obtained from these surveys has made it possible to estimate with increased accuracy the probable cost of a proposed survey. The allocation made for the January survey turned out to be about 13 percent low. The April allotment to field offices was about 6 percent high. For the September survey the allotment was off less than 1 percent.

### Summary

Experience to date indicates that enumerative surveys are useful in providing types of data not otherwise obtainable and in checking current statistics. It is evident that they can play an increasingly important part in the collection of primary agricultural data to supplement the results of the mailed inquiry which is the backbone of the statistical work of BAE.

From the standpoint of operations the January survey was made at a bad time—roads were better in April and more farmers were available for interviews. The practice in April of obtaining pertinent data from the neighbor of an absent farm operator in a sample segment was found to be more satisfactory than the attempt in the January survey to obtain complete coverage in clean-up segments.

Farm operators, in general, gave the interviews fairly willingly. Refusals averaged a little more than 1 percent of the sample farms.

The importance of securing competent persons, training them carefully for the interviewing, and giving them close supervision, was fully demonstrated. It is evident that large-scale enumerative surveys are too expensive in time, effort, and money to be done with hasty preparation. They must be carefully planned and energetically executed.

# Survey of Transportation From Farms to Initial Markets

By Donald E. Church

*Data used in this discussion were collected in one of the two enumerative surveys evaluated in the preceding article in this issue. In addition to 1948 data on farm motortruck ownership, this paper presents new information on farm ownership of trailers and the proportion of the farm output that is hauled to market in farm-owned transportation equipment.*

TWO considerations have recently emphasized the question of the extent to which farmers are dependent upon others for the initial movement of their crops, livestock, and products from their farms. These are the increasing costs of hired motor trucking and the widespread belief that regulatory commissions may reduce the present exemptions for agricultural products hauled by for-hire equipment.

The number of farm-owned motortrucks has been reported by the Census Bureau for many years, but no statistics on a broad scale have been available regarding trailers, which are significant as substitutes for trucks. Furthermore, neither the number of vehicles nor their distribution among farms is a reliable indicator of the extent to which farmers are dependent upon for-hire truckers and buyers for the initial haulage.

### Use of Enumerative Survey

In view of the lack of adequate information about transportation at the farm level, a limited number of questions on the subject were included in the Nation-wide Enumerative Survey made by the Bureau of Agricultural Economics in April 1948. The complete survey was designed to obtain basic information on a wide range of subjects. This report deals only with the leading aspects of the transportation phase.

Farmers who were interviewed in this survey were selected to represent not only the United States as a whole, but also the four broad geographic areas outlined in figure 1 and here called the Northeast, the South, the North Central States, and the West. The sample was determined by the "probability" or "area" sampling method.

TABLE 1.—*Farm-owned trucks and trailers, by regions, 1945 and 1948*

| Region | Trucks | | Trailers | Percentage distribution | | |
|---|---|---|---|---|---|---|
| | | | | Trucks | | Trailers |
| | 1945 | 1948 | 1948 | 1945 | 1948 | 1948 |
| | *Thousands* | *Thousands* | *Thousands* | *Percent* | *Percent* | *Percent* |
| Northeast | 223 | 235 | 93 | 15 | 12 | 5 |
| North Central | 526 | 622 | 1,068 | 35 | 33 | 56 |
| South | 469 | 723 | 534 | 32 | 38 | 28 |
| West | 272 | 325 | 218 | 18 | 17 | 11 |
| United States | 1,490 | 1,905 | 1,913 | 100 | 100 | 100 |

1945 data from Census of Agriculture 1945; 1948 data from BAE Enumerative Survey.

Among other things, this sampling method prevents the biases that the selection by an interviewer may cause and that often arise when the

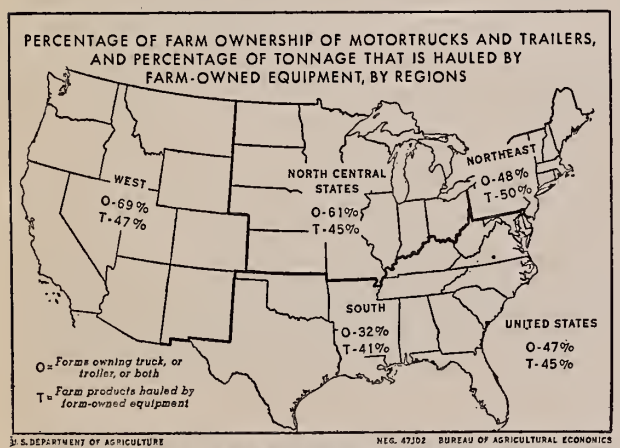



FIGURE 1.—PERCENTAGES OF FARM OWNERSHIP OF MOTORTRUCKS AND TRAILERS AND PERCENTAGE OF TONNAGE THAT IS HAULED BY FARM-OWNED EQUIPMENT, WITHIN REGIONS OUTLINED.

"quota" sampling method is used.[1] Usable returns were obtained from nearly 12,000 farms. Responses were obtained from 91 percent of the farms identified by the enumerators as eligible sample farms. This, together with the fact that a check on the non-respondents showed the incidence of trucks to be nearly the same as for the respondents, indicates that the dangers of nonresponse biases are at a minimum.[2]

[1] See Earl E. Houseman in Design of Samples for Survey, this magazine, V. 1, No. 1.

[2] Sampling standard errors of percentages for the estimates presented in tables 2, 3, 4, and 5 are estimated to be less than 2 percentage points for all cells. Errors of percentages in tables 1, 6, and 7 are somewhat larger, but probably not over 4 percentage points for any cell.

## Farm Ownership of Motortrucks

As judged by the expansion of this sample survey, almost 2 million motortrucks are now owned by farmers in this country as compared with 1.5 million in 1945 (table 1). This increase of about 28 percent is almost as large as the percentage increase in total truck registrations of all kinds throughout the country during this period. The number of farm trucks increased in all areas but the percentage rise was largest in the South, followed by the West and the North Central States.

The increase in the number of farm trucks has been especially great since 1940 and has resulted in a rapid increase in the percentage of farms owning trucks (table 2). At present, approximately 29 percent of the farms in the country own at least one truck, with all regions other than the South having a higher-than-average ownership ratio. More than half of the farms in the West own trucks.

TABLE 2.—*Farms owning trucks as percentage of all farms, by regions, specified years, 1920–48*

| Year | United States | Northeast | North Central | South | West |
|---|---|---|---|---|---|
| | *Percent* | *Percent* | *Percent* | *Percent* | *Percent* |
| 1920 | 2 | 5 | 3 | 1 | (1) |
| 1930 | 13 | 30 | 18 | 7 | 23 |
| 1940 | 16 | 30 | 17 | 9 | 30 |
| 1945 | 22 | 36 | 24 | 15 | 44 |
| 1948 | 29 | 40 | 29 | 22 | 52 |

[1] Less than ½ of 1 percent.

1920–45 from Censuses of Agriculture; 1948 from BAE Enumerative Survey.

Farm-owned equipment has small carrying capacity. About 41 percent of the trucks have a "manufacturer's rated capacity" of one-half ton or less, and 92 percent have a rated capacity no greater than 1½ tons (table 3). The actual carrying capacity (in contrast to rated capacity) of a truck usually is in the neighborhood of two or three times the rating, depending upon sizes of tires and other variable mechanical factors.

TABLE 3.—*Manufacturer's rated capacity of farm-owned trucks, as a percentage of all trucks, by regions, 1948*

| Rated capacity | United States | North-east | North Central | South | West |
|---|---|---|---|---|---|
| | *Per-cent* | *Per-cent* | *Per-cent* | *Per-cent* | *Per-cent* |
| ½ ton and under | 41 | 36 | 37 | 51 | 33 |
| Over ½ but less than 1½ tons | 16 | 15 | 17 | 15 | 16 |
| 1½ tons | 35 | 38 | 40 | 29 | 41 |
| Over 1½ tons | 8 | 11 | 6 | 5 | 10 |
| All capacities | 100 | 100 | 100 | 100 | 100 |

This and all following tables are based on the BAE Enumerative Survey.

## Farm Ownership of Trailers

No one doubted that trailers are used extensively in farm-to-market movements but the figures compiled from the enumerative survey show that an unexpectedly large percentage of farms own a trailer. Almost as many farms own only trailers as own only trucks (table 4). The percentage of farms owning one or more trucks irrespective of ownership of trailers equals the sum of lines 1 and 3 in table 4; the percentage of farms owning trailers irrespective of truck ownership equals the sum of lines 2 and 3. Thus 29 percent of the farms in the United States own trucks and 27 percent own trailers. Few farms owned both—9 percent. This gives clear evidence that many farmers use trailers instead of trucks, and that there is relatively little disposition to own both unless more than one hauling unit is needed. The number of farmers with more than one hauling unit are not many—only 14 percent [3] of the total number of

[3] For the United States as a whole: 33 percent of farmers owned only one hauling unit (either one truck or one trailer), 10 percent owned two units (two trucks, two trailers, or truck and trailer), and 4 percent owned more than two units.

TABLE 4.—*Percentage of farms that own trucks or trailers or both, 1948*

| Equipment | United States | North-east | North Central | South | West |
|---|---|---|---|---|---|
| | *Per-cent* | *Per-cent* | *Per-cent* | *Per-cent* | *Per-cent* |
| Trucks only | 20 | 32 | 18 | 17 | 33 |
| Trailers only | 18 | 8 | 32 | 10 | 17 |
| Both trucks and trailers | 9 | 8 | 11 | 5 | 19 |
| Total | 47 | 48 | 61 | 32 | 69 |

TABLE 5.—*Percentage of farms that own trucks and trailers, by size of farm, 1948*

| Size of farm | Own trucks | Own trailers |
|---|---|---|
| | *Percent* | *Percent* |
| Under 10 acres | 16 | 13 |
| 10–99 acres | 20 | 18 |
| 100 acres and over | 40 | 38 |

farms in the country owned more than one.

It is possible that the ownership of trailers, from the standpoint of haulage from farm to market, is somewhat overstated in this survey; some trailers that are used exclusively on the farms may be included, for about 40 percent of the trailers were reported to be "normally hitched" behind tractors.

## Tonnage Hauled by Farmers Compared With Haulage by Others

About 45 percent of the total tonnage of all agricultural crops, livestock, and products sold by farmers was moved initially from the farms in farm-owned trucks, trailers, or wagons (table 6). This percentage is strikingly high in view of the fact that the haulage equipment used by farmers is mostly of light capacity. It is an interesting coincidence that the total percentage of farms owning trucks and trailers (either one or both) was almost the same as the percentage of tonnage hauled from farms in farm-owned equipment. There were considerable regional differences, however, between the percentage of farms owning trucks and/or trailers, and the percentage of total tonnage hauled in farm-owned equipment (fig. 1). These regional differences arise mostly from varia-

TABLE 6.—*Percentage of tonnage hauled from farms by owned, hired, or buyers' trucks, by regions, 1947*

| Method of transport | United States | Northeast | North Central | South | West |
|---|---|---|---|---|---|
| | *Percent* | *Percent* | *Percent* | *Percent* | *Percent* |
| Farmer-owned equipment [1] | 45 | 50 | 45 | 41 | 47 |
| Hired by farmer [2] | 33 | 19 | 42 | 39 | 22 |
| Operated for or by buyer | 22 | 31 | 13 | 20 | 31 |
| Total | 100 | 100 | 100 | 100 | 100 |

[1] Including owned or borrowed trucks, trailers, and wagons; wagons alone account for about 2.5 percent of U. S. movement and are used largely in the South and the North Central States, accounting for 7 percent and 2 percent, respectively, of total movements in those regions.

[2] Includes all movements for which farmer paid a specific transportation charge, even though paid to a buyer who supplied the trucking services.

tions in the marketing and transporting practices used for different products (table 7). Also a mere count of the number of farmers owning equipment should not be expected to measure the tonnage hauled not only because some farmers own more than one hauling unit but also because there is wide variation in the use of equipment.

TABLE 7.—*Percentage of tonnage of groups of agricultural products hauled from farm by farm-owned equipment and in hired or buyers' trucks, United States, 1947*

| Commodity | Farm-owned trucks, trailers, and wagons [1] | Trucks hired by farmer [2] | Trucks operated by or for buyer |
|---|---|---|---|
| | *Percent* | *Percent* | *Percent* |
| Cotton | 70 | 28 | 2 |
| Vegetables | 59 | 20 | 21 |
| Grains | 54 | 34 | 12 |
| Tobacco | 44 | 52 | 4 |
| Fruits | 40 | 20 | 40 |
| Milk | 30 | 41 | 29 |
| Poultry and eggs | 27 | 13 | 60 |
| Miscellaneous | 46 | 24 | 30 |
| Total crops and products | 45 | 33 | 22 |

[1] Including owned or borrowed trucks, trailers, or wagons.

[2] Includes all movements for which farmers paid specific transportation charges, even though charges were paid to buyers who supplied the trucking services.

## Haulage of Major Classes of Agricultural Products

Illustrating the wide differences among commodities is the fact that about 70 percent of the total tonnage of cotton was hauled in farm-owned vehicles (trucks, trailers, or wagons) whereas, at the other extreme, farmers hauled only 27 percent of the poultry and eggs to market by these means.[4]

A somewhat arbitrary distinction had to be made in the survey between for-hire haulage and service supplied by the buyers. Any haulage for which the farmer paid a specific transportation charge was deemed to be for-hire haulage. In the case of milk particularly (and to a lesser degree in other products) some buyers furnish the transportation but make a specific charge for the service; this was considered for-hire carriage. The percentages in column 3 of table 7 represent the percentages hauled by buyers who did not assess specific transportation charges against the sellers—presumably the cost of the service was absorbed by lower farm prices.

## Conclusion

1. Slightly less than half of the farmers own motortrucks or trailers.

2. Nearly half of the agricultural tonnage moves from the farms in farm-owned trucks, trailers, or wagons. Farmers pay specific transportation charges for about one-third of the tonnage hauled; and buyers, without charging specifically for transportation, supply haulage for the remaining fifth of the tonnage.

3. Trailers constitute important haulage units and should be considered in any situation involving farm transportation. Twenty-seven percent of the farmers own trailers; two-thirds of these farmers have no trucks.

[4] The omission of the farmer's automobiles as a means of hauling produce to market is most serious in regard to eggs. However it was thought necessary to leave automobiles out of the survey because of the difficulty of getting reliable information on the quantity of produce hauled by that means.

# Adjustment for Bias Caused by Non-Response in Mailed Surveys

By Walter A. Hendricks

*This article is a companion to the one in the last issue which reported on the use of an enumerative survey to determine biases that may exist in mail data. This discussion presents some exploratory thinking on ways and means of using the mailed survey data, themselves, to determine and adjust for such biases.*

INCOMPLETENESS of returns in a mail survey usually implies a certain degree of bias in the results because a respondent's willingness to return a schedule is generally related to the nature of the item to be estimated from the survey. The bias may be either positive or negative, depending upon whether prospective respondents with large or with small quantities of the item are the more willing to take the trouble to fill out and return the schedules. This does not mean that the amount he has of the item is the main influence in his decision to return or not to return the schedule. It means simply that the amount of the item is correlated with the factors that affect the decision. The actual amount of the item itself may be exerting no causal effect at all.

The fact that such biases exist has been rather generally known ever since mail surveys were first used by statisticians. Methods for dealing with these biases have been tested from time to time. At one extreme, there have been suggestions that mail surveys be abandoned as a sampling tool and that interview-sampling methods be used exclusively. That proposal has not been universally adopted by statistical agencies because interview sampling methods are usually expensive. Furthermore, some statisticians, including the author of this article, have clung rather tenaciously to the opinion that a careful analysis of the behavior and characteristics of the respondents to mail surveys would reveal some pertinent relationships that would make it possible to estimate the extent of the bias in any survey and to make the necessary adjustments.

For many problems, the application of scientific principles to the use of mail surveys would probably strengthen such surveys to the point where they would yield just as accurate results as do enumerative surveys. This is not an attempt to minimize the importance of enumerative surveys in an over-all statistical program; enumerative surveys are needed to provide the base information that must be available before mail surveys can be used scientifically. Furthermore, there will always be situations in which an enumerative survey is the most practicable method of getting data. It means, however, that a mail survey should be planned with as much attention to scientific principles as an enumerative survey. When that is done, the mail approach can be expected to yield satisfactory results in many situations in which its use has seemed undesirable.

Devices that have been used to adjust the results from mail surveys include (1) enumeration by interview of a subsample of the non-respondents to the mail surveys, (2) charting of historical data from mail surveys against more accurate data obtained later by complete enumeration or similar methods, and (3) using control information that is known for both respondents and non-respondents and that is also correlated with the item to be estimated, to "true-up" the returns received by mail. All these methods, together with the direct-interview type of survey itself, have been tested by statisticians of the BAE and other statistical agencies. Each seems to have its proper place in the over-all sampling program of a statistical organization. It is not the purpose of this article to give an appraisal of these methods; they are merely mentioned to provide some background for the discussion of a problem that has seemed hopeless of solution, but one that has intrigued the writer for some time.

## Estimating the Bias

Suppose a statistical agency sends questionnaires to every individual in a universe, or in a well-designed sample of that universe, and only a fraction of those questionnaires are filled out and returned. Past experience with mail surveys in

general makes it plain that there is a good chance of bias being present in the results. But suppose that neither final check data nor control information is available. Under those conditions would it be possible to estimate the bias in the mailed returns without sending out some interviewers to visit a sample of the non-respondents? Some data assembled by the North Carolina Research Office, at Raleigh, indicate strongly that this question can be answered in the affirmative. All that seems to be necessary is to send a few follow-up requests to the non-respondents. Returns from at least two such follow-ups seem to be needed; more successive requests for information may be used to obtain results of greater precision.

Table 1 shows the results obtained by mail solicitation from universes of 3,241 North Carolina fruit growers and 1,189 North Carolina producers of Grade A milk. In the first case assume that we are trying to estimate the average number of trees per farm; in the second case we are trying to estimate the average number of cows per producer. Those two items are particularly well suited to this study because unbiased estimates of both averages are available from independent sources to test the accuracy of the method.

TABLE 1.—*Results from repeated mailings to fruit growers and milk producers in North Carolina*

| Mailing | Fruit growers | | Milk producers | |
|---|---|---|---|---|
| | Schedules returned | Av. trees per farm | Schedules returned | Av. cows per farm |
| | *Number* | *Number* | *Number* | *Number* |
| 1 | 300 | 456 | 165 | 23. 03 |
| 2 | 543 | 382 | 170 | 23. 79 |
| 3 | 434 | 340 | 114 | 24. 23 |
| Total mailing list or universe | 3, 241 | 329 | 1, 189 | 24. 27 |

On an inspection of table 1 two things are immediately apparent. First, the per farm averages drawn from the schedules received from the three successive mailings show trends in opposite directions, in the two surveys. In these surveys large-scale fruit growers seem to be more willing to return their mailed schedules than are small-scale growers; but small-scale milk producers seem to be more willing to report than are the large-scale producers. The second striking feature of the table is the smoothness of the trend in the per farm averages, in both surveys.

## Question To Be Solved

The problem to be solved is now clear: Is there a general mathematical law that will enable a statistician to project a trend based on results from three or more successive mailings to arrive at the correct universe average, corresponding to a 100-percent response?

## Working Toward the Solution

To arrive at the mathematical form of the law that seems to be suggested by the data at hand, the first fact that seems pertinent is that the number of the mailing measures the resistance of the respondents to returning the schedules. It will be assumed that each of the 300 fruit growers who responded to the first mailing has a resistance of 1 unit; each of the 543 who responded to the second request has a resistance of 2 units, and so on. As these resistance units, which may be represented by X, lie on a scale ranging from zero to infinity it seems reasonable to assume that $\log \frac{X}{\bar{x}}$ is Normally distributed about zero in the universe. In this expression $\bar{x}$ represents the average resistance of the individuals on the mailing list.

This assumption can be readily tested. The fraction of farms responding to the first request represents the area under the tail of the log X frequency curve extending from log (0) to log (1); the total fraction responding to the first and second mailings combined represents the area under the frequency curve from log (0) to log (2), and so on. The Normal deviates corresponding to these fractions can be found in any table of the Normal Probability Integral. If log X is Normally distributed, the values of log X should be linearly related to those Normal deviates. The Normal deviates corresponding to the three values of X are compared with values of log X in table 2, for the two sets of data given in table 1.

When values of log X are plotted against the Normal deviates shown in table 2, the points lie sufficiently close to a straight line to verify the

TABLE 2.—*Normal deviates compared with logarithms of resistance to returning a schedule*

| Resistance X | Log X | Fruit growers | | Milk producers | |
|---|---|---|---|---|---|
| | | Total fraction responding | Normal deviate | Total fraction responding | Normal deviate |
| 1 | 0.000 | 0.093 | −1.323 | 0.139 | −1.085 |
| 2 | .301 | .260 | −.643 | .282 | −.577 |
| 3 | .477 | .394 | −.269 | .378 | −.311 |

assumption that log X is Normally distributed (fig. 1). This linear relationship also makes it possible to determine the average resistance of all individuals in the population to returning a schedule. If the Normal deviate is represented by D and the standard deviation of the logarithms of the resistances is $\sigma$, we have the equation

$$\log \frac{X}{\bar{x}} = \sigma D$$

or

$$\log X = \sigma D + \log \bar{x} \quad \ldots \quad (1)$$

This equation shows that when log X is plotted against D, the slope of the line represents the standard deviation of the logarithms of the resistances in the universe and the intercept on the vertical axis at D=0 represents the logarithm of the average resistance.

Using regression equations fitted by eye, we find that log $\bar{x}$ for the universe is equal to 0.600 for the fruit growers and 0.665 for the milk producers. This shows that the average resistances are 3.98 and 4.62 respectively. The slopes of the lines, representing the standard deviations of the logarithms of the resistances, are 0.454 and 0.613. These standard deviations are of no particular concern in the problem at hand, but they provide some useful side information. For example, they enable one to predict the number of successive mailings that would be required to achieve any specified degree of completeness in the coverage of the universe. But at the moment we are more interested in the average resistances.

The next step in the analysis involves studying the relationship that is present between the resistance to returning a schedule and the farmer's scale of operations. If we let Y represent the

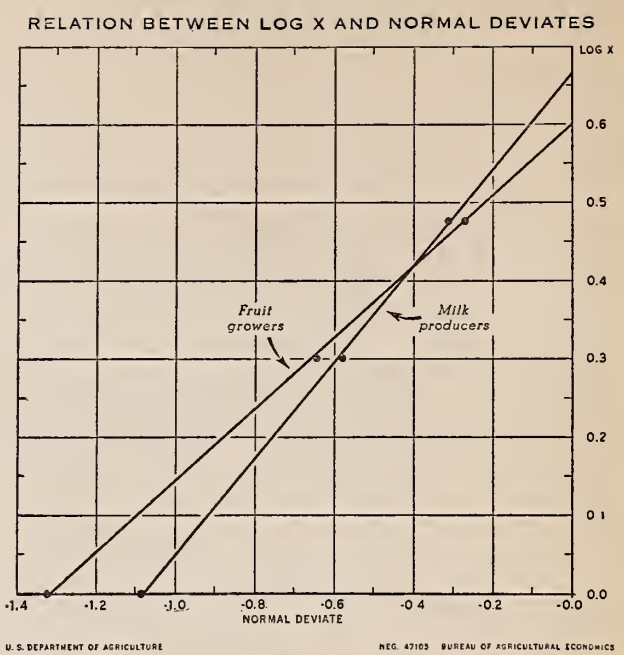



FIGURE 1.—RELATION BETWEEN LOG X AND NORMAL DEVIATES.

average number of fruit trees per farm for growers who have a specified resistance X, the relationship between Y and X can be used to estimate the universe average $\bar{y}$. But this relationship is as yet unknown. We can proceed under the assumption that a second-degree interpolation formula of the Gregory-Newton type will provide a satisfactory approximation. This is simply a quadratic equation with its constants so determined that it will fit exactly the three points on a chart that represent the data for the three mailings. It is assumed that this quadratic equation will represent the true relationship between Y and X, with a fair degree of accuracy, over a range of values of X that does not extend too far beyond the values used in fitting the equation. The relationship can then be represented by the equation.

$$Y = F(a+x) = F(a) + x\Delta F(a) + \frac{x(x-1)}{2}\Delta^2 F(a) \quad \ldots \quad (2)$$

in which $\Delta F(a)$ and $\Delta^2 F(a)$ are the first and second differences of the number of trees per farm shown in table 1, and $F(a)=456$. We have

| a+x | x | F | ΔF | Δ²F |
|---|---|---|---|---|
| 1 | 0 | 456 | | |
| 2 | 1 | 382 | −74 | |
| 3 | 2 | 340 | −42 | +32 |

This yields the equation

$$Y=456-74x+\frac{32x(x-1)}{2} \quad . \quad . \quad . \quad (3)$$

in which $x=X-1$.

Substituting the universe average $\bar{x}=3.98$ for X, or $x=2.98$, in this equation, should give the universe average number of trees per farm. Making the necessary computations yields the following result:

$$\bar{y}=456-(74)(2.98)+(16)(2.98)(1.98)=329.9$$

This value is approximately equal to the value 329 which happens to be known in advance in this case.

Applying the same analysis to the milk-producer data gives:

| a+x | x | F | ΔF | $\Delta^2$F |
|---|---|---|---|---|
| 1 | 0 | 23.03 | | |
| 2 | 1 | 23.79 | +0.76 | |
| 3 | 2 | 24.23 | +0.44 | −0.32 |

$$Y=23.03+0.76x-\frac{0.32x(x-1)}{2}=$$

$$23.03+(0.76)(3.62)-(0.16)(3.62)(2.62)=24.26$$

This also closely approximates the known universe figure of 24.27.

## Discussion of Results

Everything considered, this method shows considerable promise as a basis for adjusting the results of a mail survey for incompleteness. It is necessary, of course, to have a representative sample of the universe for the original mailing list, such as might be obtained from a basic enumerative survey, and to have data from at least three mailings before the method can be applied. But this is not an unsurmountable obstacle. It certainly involves much less work and expense than an enumerative survey of even a small sample of non-respondents.

In many ways the behavior of data obtained from successive mailings is analagous to the behavior of data obtained from successive "call-backs" in an enumerative survey, although a different set of factors is operating in the two situations. But the methods described here are probably not to be recommended for the analysis of call-back data because of the high degree of completeness that is attained both before and after the call-backs are made. Under such conditions, another technique of adjusting for incompleteness, when the call-backs fail to attain 100-percent completeness, would probably be more satisfactory. It might be mentioned as a point of interest that the possibility of using the present approach in mail surveys first occurred to the writer in connection with discussions of the call-back problem in enumerative surveys.

Data from more mailed surveys need to be investigated from this viewpoint to learn whether relationships of the kind found here represent the general rule. There is reason to believe that this will be the case, but the point should certainly not be accepted without further investigation. The relationships found with different kinds of subject matter would be of particular interest.

The mathematical form of the relationship between Y and X also needs further investigation with more extensive data, particularly for data in which more than 50 percent of the schedules are returned. A quadratic equation cannot represent the relationship for values of X covering a range that gives cumulative responses ranging from a figure of less than 50 percent to one of more than 50 percent. If Y is a function of X represented by F (X), we must be dealing with a function of such a form that $F[-(X-x)]$ is at least approximately equal to $-F(X-\bar{x})$. The data at hand do not cover a sufficiently wide range of potential responses to permit the determination of the true nature of this relationship. Another refinement that seems to be called for would be to use a value of $X=0.5$ rather than 1.0 for the first mailing, $X=1.5$ rather than 2.0 for the second, and $X=2.5$ rather than 3.0 for the third. The average resistance of the respondents in each of the three categories returning the schedules would be represented more accurately by those numbers. It may be pointed out that in both sets of data discussed in this paper $Y=F(X)$ could be represented accurately over the range of values of X with which we are dealing by a simpler quadratic equation of the form $Y=\bar{y}+b(X-\bar{x})^2$. It would be interesting to learn whether this is accidental or whether it is characteristic of the behavior of mail-survey data over this range.

In general, the results obtained here indicate that the resistance of a potential respondent to returning a schedule changes rather rapidly as we move a short distance in either direction from the average amount of the item on hand, but that

the resistance tends to stabilize when we reach respondents who have relatively large or relatively small quantities. It is known, for example, that a large-scale fruit grower has about the same psychological attitude toward returning his schedule regardless of whether he has 5,000 trees or 50,000. Similarly, small-scale producers are about the same sort of individuals, on the average, regardless of whether they have 10 trees or 50. The big differences in the kind of people who form the universe of potential respondents are found somewhere between an upper limit on the small-scale producers and a lower limit on large-scale producers.

The methods discussed here do not seem to work well when the universe is small. Table 3 shows the results obtained by sending four successive requests to a universe of 253 chick hatcheries in North Carolina. The hatching capacity of the hatchery is the variable under study.

The schedules returned on the successive mailings represent such small samples that a few unusually small or large hatcheries make the resulting average of the capacities rather erratic. Although there was an obvious tendency for a greater proportion of the larger hatcheries to respond to the survey, no clear-cut trend in the average capacity from one mailing to the next can be seen. It should also be borne in mind that no method of sampling is very efficient when the universe is small and subject to a high degree of variability.

TABLE 3.—*Results from repeated mailings to chick hatcheries in North Carolina*

| Mailing | Schedules returned | Average egg capacity |
|---|---|---|
| | *Number* | *Thousands* |
| 1 | 71 | 52. 5 |
| 2 | 43 | 52. 3 |
| 3 | 14 | 61. 5 |
| 4 | 14 | 56. 5 |
| Universe | 253 | 46. 3 |

# Economic Utilization of Feeds on American Farms

By Neil W. Johnson

*In this progress report for the first year's work on a project investigating the economic utilization of farm-grown feeds in livestock production, the exploratory methods are covered and a body of material is set forth from which hypotheses for further investigation can be developed.*

EXPLORATION of the possibilities of increasing industrial utilization of both the basic and the waste products of agriculture is extensive. The possibilities in increased utilization of farm products on the farm are less spectacular but they are just as significant and considerable effort is being directed toward developing them. Wherever it is feasible to substitute forage crops on acres now producing corn, cotton, or wheat, and to utilize these crops profitably through livestock, there are opportunities to combat effectively the threat of so-called surplus production. Adjustments of this kind also work in the direction of improving the national diet, conserving soil resources, and lending greater stability to farm incomes.

Those interested either in on-farm or in off-farm utilization of farm products are faced with essentially the same two questions: (1) Is the proposed means of utilization technically feasible? (2) Will it pay? The new industrial product derived from an agricultural source must compete both in performance and in price with products derived from other sources of raw materials. So, too, on the farm the forages frequently compete directly with cash crops that bring in good income. Their adoption or expansion hinges directly, in the farmer's mind, on the question of their profitable utilization. Shifts may involve a series of farm adjustments that call for time, money, and management. Lime and fertilizer, seed, and farm machinery may have to be bought and the fertilizer or lime applied, fields may have to be fenced, farm-service buildings erected, new livestock enterprises added or emphasized, and the whole program of farm labor and its distribution may have to be recast. The relative importance of these factors varies from farm to farm and from area to area, making the question of profitable utilization one on which farmers everywhere need assistance. And beyond these immediate considerations profitable utilization involves study of the longer term aspects of the problem on several levels: the individual farm, the area, the region, and the country as a whole.

Funds appropriated under authorization of the Research and Marketing Act made possible a project on which work was begun in October 1947. Three members of the staff of the Division of Farm Management and Costs in BAE—one each for the Northern, the Southern, and the Western States—have devoted full time to the project.[1]

## Procedure and Method

Economic evaluation in a study such as this can be based only on a thorough understanding of the present situation in forage production and utilization and of the possibilities for increasing forage supplies and using them efficiently. Consequently, the first year's work has been mostly reconnaissance, consisting of a thorough examination of the results of experimental work and of farmer and rancher experience.

Aspects of the problem have been discussed with production specialists and agricultural economists in well over half of the land grant colleges. Washington and field personnel of several agencies in the Department of Agriculture have served as technical advisors—the Bureau of Plant Industry, Soils, and Agricultural Engineering, the Bureaus of Dairy Industry and Animal Industry, the Soil Conservation Service, and the Forest Service. More than 60 farmers who have made progress in emphasizing forage production and use have contributed from their experience.

[1] Berryman R. Hurt has conducted investigations in the Northern States, John E. Mason in the Southern States, and Lloyd E. Jones in the Western States. The author, formerly supervisory leader of the project, has worked in close cooperation with C. W. Crickman, E. L. Langsford, and H. L. Stewart, the Division's research supervisors for Northern, Southern, and Western agriculture.

Out of this combination of results of research and their application on farms, for a limited number of farming systems economic appraisals have been made of the probable effects of the production of more forage on the farm organization, its operation, and income.

In appraising the income possibilities of these systems, some level of prices and costs must be used. Price-cost data for the 1942–46 and 1925–29 periods have served as general guides to test the farming systems being developed in this study. When selecting these two historical periods, reference was made to the report "Long-Range Agricultural Policy" prepared by the Bureau of Agricultural Economics for the Committee on Agriculture of the United States House of Representatives, in March 1948. That report studies situations that might exist during 1955–65, in this country, under different specified assumptions regarding employment, income, prices, and related factors. In table 1 these assumed conditions have been related to actual past periods. The relationships shown in this table for the country as a whole have been generally adapted to those presently prevailing in areas where case farms are located. In the interest of simplification, reference is made hereafter only to "high-level" and "medium-level" prices and costs.

TABLE 1.—*Indexes of prices received and paid by farmers, and parity ratio, assumed situations, and selected historical periods, 1910–14=100*

| Situation | Prices received by farmers | Prices paid by farmers[1] | Parity ratio [2] |
|---|---|---|---|
| High employment [3] | 200 | 200 | 100 |
| 1942–46 (High price level) | 196 | 170 | 115 |
| Intermediate employment [3] | 150 | 175 | 86 |
| 1925–29 (Medium price level) | 149 | 168 | 89 |
| Intermediate employment [3] | 100 | 150 | 67 |
| 1935–39 (Low price level) | 107 | 128 | 84 |

[1] Including interest and taxes.
[2] Ratio of prices received to prices paid, for commodities, interest, and taxes.
[3] For more complete description of conditions assumed to accompany these levels of employment see table 4, page 28, of the report, "LONG-RANGE AGRICULTURAL POLICY."

The historical periods as such have little significance other than to aid in establishing general levels of prices and costs and establishing internal price-and-cost relationships that conform with situations that could develop for agriculture. Indeed, *general* adoption of forage-using systems would probably generate an entirely new set of farm price-and-cost relationships. These could have considerably different effects upon farm returns from those now calculated for situations in which moderate progress in the extension of forages have been assumed.

In our preliminary economic analyses the approach has been mainly that of studying the possible effects of increasing forages on a limited number of farms representing significant farming situations in different parts of the country. Taking a farm as now organized and operated, the researcher in his calculations has increased the forage acreages, made corresponding decreases in some of the soil-depleting intertilled crops, added some type of forage-consuming livestock, and made the related adjustments needed to establish the new system of farming. For the sake of simplicity, the analysis has focused mainly on the net cash income to be derived from certain alternative ways of organizing the farm business. But attention has been given to changes in livestock inventories, to types of new investments that would be needed, to changes in the requirements for hired labor, to total distribution of labor through the year, and to deferments of income that occur during the years when the farm is being reorganized.

A real difficulty in such a budget analysis is to find reliable input-output data to use in visualizing the potentialities of alternative systems. At the land-grant colleges and in the Department of Agriculture there is a growing body of research designed to throw more light on both forage production and forage utilization. But a considerable proportion of this research data has only limited usefulness in this study. Many of the agronomic studies have been conducted on a plot basis. Frequently feeding experiments have been confined to a single lot of purebred animals and to a single feeding rate. There is need for experiments designed to approximate as closely as possible the conditions found on representative farm units and the practical range of feeding rates, and substitutions of one type of feed for another. Coupled with this need is the whole problem of the quantity and quality of the livestock product that results from varying the proportion of forages and concentrates in the feeding rations.

We need also to know the physical costs of es-

tablishing pasture, from area to area, and what carrying capacity may be expected under different systems of pasture management. We need more information on the effect on crop yields and on the level of soil fertility of cropping systems and combinations of cropping practices that give more emphasis to forage production. We need better measures of fertility decrement and increment, and measures of actual soil loss that results from different cropping systems.

Then there is the problem of the *quality* of the forage that is being fed. Researchers everywhere realize that the average quality of forage consumed on farms is considerably below that used in most controlled feeding experiments, which adds to the difficulty in making definitive economic appraisals. Farmer or rancher experience is likewise insufficient as a base for making wide generalizations.

The problem then is to fit together what is available and supplementing this, when necessary, with the best judgment of competent workers in order to be ready to make a first approximation to the required answers.

## Preliminary Findings

Space does not permit reporting here the details of the farming situations that have been studied but preliminary findings are perhaps of wider interest.

Northern States.—Three case farms, representing important systems of farming in the Corn Belt, have been studied in detail. The first was a 240-acre cash-grain farm of level all-tillable land in the central Corn Belt; 70 percent of its acreage was producing corn and soybeans. The second was a 160-acre cash-grain farm in the western Corn Belt that had half the cropland in corn and the rest in small grains, hay, and pasture. The third was a 225-acre general farm in the central Corn Belt located in more rolling country with soils of inherently lower fertility. In all of these situations alternative plans of farm organization were studied which would give greater emphasis to forage production and its utilization through livestock. The purpose in this phase of the analysis was solely to investigate whether increased quantities of forage could be utilized profitably in farming systems. No attempt was made to find the *most profitable* level of forage production and utilization.

Some of the observations arising from these preliminary studies in the Corn Belt are here briefed.

1. Many but not all "high-forage" systems of farming increase net cash farm income, compared with present cash-grain and general systems. Each farmer should analyze his own situation carefully before making a shift, however. In some instances, the increase in income is not enough to encourage the change.

2. Corn Belt farmers generally would put in more days of work when carrying out systems that involve growing and using large quantities of forage than in handling present cash-grain and some of the general-farming systems. The return for each hour of work would not be so large now. But much of the extra labor would come during the winter.

3. New investments in the farm business usually would be essential when establishing and operating the new plans.

4. High-forage systems involve larger cash expenditures than do cash-grain and some general-farming systems. When feeder cattle are bought to utilize large quantities of forage, the farmer increases his risk of financial loss.

5. Net cash farm income from the high-forage systems would be larger, in nearly every instance, under the high level of prices than under the medium level. Compared with the net cash farm income to be obtained from present systems, under both the medium and the high level of prices, the percentage increase in income resulting from a shift to more forage would be larger under medium prices than under high prices. This feature grows out of the relationships between prices of grain and livestock in the two levels of prices. The result would be different were these relationships changed.

6. Power requirements of farms, measured in terms of hours of tractor use, are not lowered materially by high-forage systems compared with cash-grain and general systems.

7. Achievement of the high-forage systems studied for the selected farms would involve major changes in farm organization and operation. More moderate shifts to grasses and legumes probably could be made more quickly and more easily on many farms.

Southern States.—In the Southern States a

considerable number of farmers who have made progress in using forages were visited. The major purpose was to gain an understanding of the kinds of problems encountered in the extension of forage and its profitable use.

Several observations stem from this reconnaissance.

1. To achieve satisfactory year-round systems of forage utilization requires temporary or supplemental crops in most Southern areas for which research data and farmer experience are available. This may be overcome by irrigating permanent pastures but data are too limited to indicate whether this practice would be generally profitable.

2. Except for special situations, few Southern farmers are likely to find it profitable to convert *entirely* to hay, pasture, or other forage crops. But many farmers would profit by emphasizing forage production and its utilization by livestock.

3. Conversions to systems that use forage profitably often require several years of time, the expenditure of additional funds, and some deferment of income. Recent farm incomes have put more farmers in a position to make such adjustments without hardship.

4. Modest additions to pasture acreages, the application of a few more bags of fertilizer, the seeding of some of the newer grasses and legumes, the use of new cultural practices, and the gradual expansion of livestock on many Southern farms indicate significant growth in the grassland acreage and in the livestock population.

5. Farm experience and experimental results indicate that it is technically feasible and economically profitable to produce milk from a year-round grazing system. Both suggest, however, that it pays to feed concentrates, even though purchased, to the higher producing cows.

6. Many possibilities for economic appraisal are offered by the information on year-round grazing systems; by results of specialized experiments on winter grazing, on rotational grazing, on forest grazing, on supplemental feeding; and by the experiments in fertilization. The more promising of these research results should be tested to see how they would fit into the operations of representative farms. Such work will show the potentialities. We need also to gain a better understanding of the practical problems that prevent farmers from realizing fully on these potentials.

Western States.—The possibilities in seeding wheatland to crested wheat grass and using the additional forage in livestock production have been studied in detail for two representative wheat-cattle ranches in southwestern North Dakota. In the one, the effects of *permanent* seedings of crested wheat grass are studied; in the other its possibilities for use in a long-time rotation.

Similarly, grass and legume mixtures have been introduced into the calculations for a badly eroded farm in southeastern Nebraska and for a grain-livestock farm in the east-central part of the State. The effects of range improvement (by artificial versus natural reseeding) on the organization, operation, and income of a family-sized cattle ranch in the Intermountain area was given added study.

1. Possibilities for adding to the stability of wheat-cattle ranches in the Northern Great Plains by shifting lower yielding wheat acreages to crested wheat-grass and utilizing the increased forage in livestock production were evident.

Such adjustments involve a minimum of 3 years during which temporary reductions in net cash income are probable. Heifers or cows must be retained, and cattle numbers increased, to take advantage of the increased grass. Receipts from sales of cash grain will be reduced. New expenditures will be made for crested wheat-grass seed and fencing. Some feed may need to be bought. Increases in livestock inventories will partially offset most of these temporary drains on income.

The economic feasibility of such adjustments is influenced by the prevailing levels of prices and costs. In general they are made more easily at high price levels than at medium or lower levels.

More hours of labor are saved in the case of seeding and harvesting wheat and in tilling summer-fallow than are spent in caring for the additional livestock. Annual cash operating expenses are reduced. Feed supplies are made more certain and soil resources are conserved to better advantage.

The extent to which it is economically feasible to substitute crested wheat-grass for cash-grain production is a matter to be determined on each ranch.

2. A few farmers are experimenting with long-time rotations involving the cash-grain crops and crested wheat grass. Preliminary results indicate that yields of both cash grains and forages are increased. Problems in ranch organization and operation are similar to those found where crested wheat is seeded down permanently.

3. Rolling topography, relatively high rainfall, and large acreages of intertilled crops make the Corn Belt part of the Eastern Plains susceptible to erosion.

By increasing grasses and legumes along with livestock, many farmers within this area have been able to retard erosion, increase soil fertility, improve soil structure, and stabilize the income. In making the adjustments, these farmers have had many of the problems found by wheat-cattle ranchers of the more arid part of the Plains in seeding wheatland to crested wheat grasses, and their incomes have been lower during the transition.

Considerable planning for changes in field boundaries and crop-rotation systems must be done during the earlier years. New boundaries may call for removal of old fences and building new ones.

4. As the strong demand for grass seed will probably continue for some time, a limited number of farmers who find it difficult to increase livestock numbers may find the commercial production of grass seed profitable.

5. Throughout much of the West ranchers may profitably increase the productivity of their ranges through natural or artificial reseeding.

These adjustments involve a minimum of 3 years during which there will be temporary reductions in net cash income. Additional female stock must be retained and the size of the herd increased to use the additional grass.

With artificial reseeding, grass seed must be bought and cash spent for preparing a seedbed and drilling. On many ranches additional private range must be leased or feed must be bought while a stand of grass is being established. Additional fencing may be necessary to protect the new seedings.

With natural reseeding, no money is spent for grass seed or seedbed. Because of the larger acreages usually involved, however, larger cash expenditures will be incurred for fencing and for renting additional range to replace the deferred range or for buying feed for the winter feeding period.

Economic and physical research on the merits of artificial and natural reseeding is relatively new. Both kinds have their place in improving the range. Because of variation in such physical characteristics as moisture, soil type, condition and type of cover, the decision of whether and how to reseed must be determined individually for each site.

6. It is anticipated that acreages of irrigated pastures will continue to expand. The newly irrigated areas in the Plains will probably not shift their extensive farming systems to growing specialized crops to the extent found in the earlier irrigated areas. Other factors encouraging forage production include the expanding population on the west coast with its increasing demand for meat and livestock products together with a declining postwar market for some specialty crops. Irrigated soils, especially those in more arid areas, require a rotation which includes grasses to maintain and improve soil fertility and structure.

## General Observations

The reconnaissance of the first year has provided the foundation upon which the more intensive phases of the work can be built. Certain general observations have grown out of our discussions with farmers and researchers.

1. In all parts of the country there are farmers who have made progress in developing systems of farming that make more use of forage crops. Many of them are above average in managerial ability, or are adept in the handling of livestock, or have adequate capital reserves to make changes in their systems. The present systems of some of these farmers have been achieved through an extended process of evaluation and experimentation. They have made use of results of research and of the experience of other farmers, but considerable effort and ingenuity have been necessary in adapting them to the individual situations.

2. There is an extremely wide range in farmers' investments for handling and harvesting forage. In some instances the crop is harvested by livestock grazing it off; in others heavy expenditures are made for such equipment as field choppers or balers, elevators, barn driers, and silos. This variation is an important consideration in working toward the greatest economic advantage from farming systems organized to give greater emphasis to forage.

3. Several influential factors tend to encourage the production and utilization of more forage in farming systems.

Many farmers have accumulated reserves of capital during the war years that they are willing to invest in developing more stable farming systems. They can take a temporary reduction in current income for the sake of more stable incomes in the future.

Realization is growing that soil resources are exhaustible and that emphasis on forage is an effective means of maintaining and even increasing fertility reserves.

State and Federal educational and action programs with their emphasis on soil and water conservation and stability in farming, together with the incentives offered to induce change, continue to stimulate farmer interest.

The development of new and improved forage crops and the increasing body of knowledge regarding possibilities for profitable utilization are having a cumulative effect.

Wartime experience with high prices for the feed grains, particularly in feed-deficit areas, stimulates farmer interest in home-grown leguminous forages of high quality.

4. Some noteworthy factors tend to retard production and utilization of more forage in farming systems.

Greater *current* profits may perhaps be had from competing enterprises.

Some farmers in some areas cannot finance the necessary moves in initiating and developing the new systems.

The principal outlays that may be involved in additional forage production are for fertilizers, grass seeds, fencing, and equipment for producing, harvesting, and storing the crop. Outlays involved in forage utilization may include investments in livestock and in buildings and

equipment. Not all of these items constitute problems for every farmer but some of them are sure to have their impact. The relative scarcity and high present price of grass and legume seeds is perhaps one of the most usual hindrances.

Concentration may be on short-run profits at the expense of long-time farm stability with a reluctance to face transition of several years during which annual income may be below that currently realized.

Cash crop enterprises may be given more attention than is given to the production of high-quality hays and pastures.

Systems of leasing land may discourage tenants from making any but short-time investments.

Farms may be too small to use other than intensive systems of farming.

Cash-crop farmers may be unwilling to acquire the skills needed in livestock production.

Some farmers do not care to do the additional hours of work nor to pay to have it done.

Many farmers are reluctant to assume unnecessary risks and expenses.

5. Several important aspects that will be studied in the more intensive phases of the work are outlined here.

Grassland systems calling for less intensive cultivation are usually thought of as extensive systems requiring larger acreages to provide an adequate farm income than systems that apply more labor and capital to each acre. The whole problem of size of enterprise needs evaluation in its effect on the economic feasibility of extending forage use.

Work to date indicates many opportunities for greater emphasis on forage production and utilization on present types and sizes of farms without going into complete conversions to grassland systems.

Attention has been mainly focused on the out-of-pocket costs involved in extending forage uses, and on the net cash incomes that might result. Although the influence of the forages in maintaining and improving soil productivity in the economic analysis has been recognized, no money value has been placed on it. Variations in sales value of farms afford a poor basis for these evaluations as they are influenced by farmers' expectations of high income rather than by actual changes in the productivity of the land. This problem deserves study in any careful analysis of the net effect of adjustments in farming.

To date the analysis has been almost entirely in terms of the effect on the individual farm. Equally significant are the aggregate effects on an area, or a region, and the country as a whole. More grass and legumes mean fewer acres of other crops that formerly used the cropland. More meat and milk may mean less pork and soybeans. What shifts in cropping and livestock patterns are foreseeable? What rates of progress in obtaining adjustments are probable?

These questions involve factors that are incapable of accurate measurement, yet no adequate analysis can afford to ignore them. Aggregate effects will be studied at least on the basis of representative farming areas. There it will be possible to study interfarm movements of feed and livestock, inshipments and outshipments of concentrate feeds and forages, market outlets for more of the products of roughage-consuming livestock, and other factors that will have a cumulative effect as more and more farmers give greater emphasis to forage.

In four States—Iowa, Kansas, Alabama, and Wisconsin—intensive studies are now in progress or are planned for the immediate future.

# Incompleteness in a Census of Crop Areas in Japan

By Charles F. Sarle

*New work, like that reported in this article, conducted under the Occupation in two hemispheres, is giving BAE a chance to observe the effectiveness of modern sampling techniques.*

HOW complete is a "complete" census? About the only answer is "As nearly complete as the agency taking the census can make it with the resources and ingenuity at its disposal." But the Japanese Crop Reporting Service, newly organized, has a more specific answer. Two "complete" census enumerations of crop areas were made in the 46 Prefectures (States) of Japan, in 1948. One enumeration was for the planted area of the winter and spring crops of wheat, barley, naked barley, and oats, collectively called mugi. The other was for the summer crops of paddy rice, upland rice, and sweetpotatoes. Actually, there are about as many farmers in Japan as in the United States.

These two crop-area enumerations were checked for incompleteness before the crops were harvested, using mostly objective (probability) sampling methods. Incompleteness proved to be of two kinds, (1) *nonreporting* of fields in these crops and (2) *understatement* of the area of the fields reported. In Japan, the census schedule provides for the listing of each separate unit of land ownership (called a hitsu) in each specified crop, the

net area of the crop exclusive of paths, dykes, and ditches in the hitsu, the name of the owner, and the land subdivision (koaza) of the city, town, or village in which the hitsu is located. A farmer may have anywhere from 10 to 20 fields, or hitsu, under cultivation. A koaza has a name just as a village has a name. All units of land ownership, some 94,000,000 hitsu in all, are recorded in the village "land ledger," with a number, its area as determined by a land survey made during the 1870's, and the name of its present owner.

A measure of bias due to *nonreporting* of hitsu was obtained from a sample of some 37,000 koaza in which all the hitsu in the specified crops reported by farmers in the census were checked by the Branch Crop Reporting Offices against the plat maps in the land ledger, and the area of nonreported hitsu was estimated through inspection, usually by taking the area of the hitsu as recorded in the land ledger. A measure of bias due to *understatement* of the area in the specified crops as reported by the farmers on the census was obtained from a randomly selected subsample of hitsu within the sample koaza. These 70,000 subsample hitsu were actually measured by plane table surveying methods. A comparison of the measured area with the reported area of these subsample hitsu gave a measure of the bias due to understatement. This understatement could be due either to error in the land ledger survey made some 75 years ago, or to "wilful" bias because of the crop quota and collection program in effect with these crops, or to both.

The national Government's crop quota and collection program, begun during the early 1940's, undoubtedly has its effect on the incompleteness of farmers' reports of the area in staple crops. The statistical agencies of each of the 46 Prefectural Governments, which were formerly responsible for the censuses and official crop reports, had added further bias of understatement in an effort to temper the full impact of the crop quota and collection program. It was because of this situation that the Occupation requested the Japanese Ministry of Agriculture and Forestry, on January 2, 1947, to establish a national centralized Crop Reporting Service that would be independent of the Prefectural Governments. This new agency, the Statistics Bureau of the Ministry, organized in April 1947, took full responsibility for the official crop estimates beginning with the crops harvested in 1948.

Under present circumstances one would expect the incompleteness of a census enumeration of crop areas to be greatest in the case of the all important food crop of Japan—paddy rice. Actually, the incompleteness increased as the relative area and importance of the crops decreased, just as we suspect is true in the United States. The combined bias, due to nonreporting and understatement of area reported, was about 9.5 percent for paddy rice, 20 percent for mugi (aggregate area of wheat, barley, naked barley, and oats) with an area half that of paddy rice, more than 26 percent for sweetpotatoes with an area about one-fourth that of mugi, and fully 35 percent for upland rice with an area only about 3 percent of the total rice area. These measures of bias are calculated as a percentage of the area reported by the census. They were used, with some modification, by the "Crop Condition Decision Committee" (similar to the Crop Reporting Board in the United States) as factors in the correction of bias when the census was adjusted for incompleteness.

# Book Reviews

*Rural Life in the United States.* By Carl C. Taylor, Arthur F. Raper, Douglas Ensminger, Margaret Jarman Hagood, T. Wilson Longmore, Walter C. McKain, Jr., Louis J. Ducoff, and Edgar A. Shuler. Alfred A. Knopf, New York. xviii, 549, xii pp. 1949.

THIS volume was written as a textbook in general rural sociology, though the publishers are also listing it as a general "trade" book. It is the work of the head of the Division of Farm Population and Rural Life of the Bureau of Agricultural Economics, and seven present or former members of the Division's staff. It is not an official publication. The views and judgments expressed are the authors' own and not necessarily those of the United States Department of Agriculture.

The book opens with a definition of rural sociology and its functions and a discussion of the evolution of American society. Part II is devoted to Rural Organizations. Its nine chapters consider the farm family, neighborhoods, communities, villages, education, religion, local government, health, welfare, and recreation and art.

Fortunately the concept of organization is not slavishly adhered to. The chapters go beyond an analysis of organization for one or another activity into a description of how the social institutions, once organized, work to achieve the purposes for which they were called into being.

Part III gives seven chapters to rural people, their characteristics, dynamics, that is, fertility, migration and trends, land owners and tenants, farm laborers, levels and standards of living, and rural social differentials.

The material in this part is excellent as far as it goes. This reviewer, however, wishes that a few points had been amplified and now and then that more up-to-date data had been used. Average disbursements and percentage of income spent for specified purposes, based on 1935–36 information, have little meaning today. Little use is made of the Census Bureau's special reports on migration by economic and social characteristics.

Reasons for not using some of these data are clear. The treatment throughout the first three parts is succinct and closely written in order to give extended treatment to rural regions in Part IV, which has nine chapters. This designedly is a major section of the book. No other rural sociology text gives as much consecutive space to this topic. The approach to the regional differences is cultural. The importance of cultural factors in conditioning the behaviors of people, in response to many of the social and economic forces which impinge on them, is basic. From a practical point of view it cannot be overemphasized, especially to those who seek to achieve social action. This part, the authors state, "could well be considered a start toward the development of the cultural anthropology of American rural life."

The regions selected are seven major type-of-farming areas—the cotton, corn, and wheat belts, the range-livestock, dairy, western specialty, and general areas. The authors say, "these are especially significant as rural universes since within each the ways of making a living are roughly uniform." Despite an earlier disclaimer, the assumption seems to be that the type of farming is the most important of the various possible cultural determinants. Not all anthropologists would agree.

But the material given in each section under the headings, The People and Their Work on the Land, Groups and Group Relationships, and Attitudes, is well worth having. It is drawn from the resources of rural sociological research, much of it done by the authors of this report. The authors are entirely correct in stressing that this regional discussion is the chief contribution of the book. This would be so whether one preferred another regional basis, such as Odum's, or not.

The final part deals with farmers in a changing world, one of the chapters of which is given over to large farm organizations. The final chapter concerns trends and directions of change. The book is far better integrated than one would expect it to be, with so many authors involved. This is unquestionably because the authors have for long been on the same team and a very good team at that.

*Edmund deS. Brunner*

*Money, Debt, and Economic Activity.* By Albert Gailord Hart. Prentice-Hall, Inc., New York, 1948. 558 pages.

ALTHOUGH the form is a textbook on money and banking, the substance of this book is a treatise on monetary theory. Around a central core of monetary and banking theory is built an illuminating treatment of the broad issues relating to economic stabilization. Both the theoretical analysis and the empirical evidence on economic fluctuations are given a policy orientation. The book is designed mainly to "brief" the student on what he needs to know to judge the policy issues, but Hart also provides a useful summary and synthesis for mature readers who have not kept up with the voluminous monetary literature of the last two decades.

The Introduction and Part I cover most of the monetary aspects of banking. This could be done only by greatly restricting the space given to banking history and to the strictly business aspects of banking. Credit expansion is illustrated with banking data selected from experiences in World Wars I and II, and central banking is treated functionally and in the light of developments which have resulted in a sharing of the central-banking function of the Reserve Banks with the Treasury, the RFC, and other Federal financial institutions.

Relations of money to price levels and employment are treated in Part II. Four approaches are discussed: (1) The commodity approach, properly disposed of in short order; (2) the transaction-velocity approach, which, in the Irving Fisher tradition, conceives of the stock of money as turning over a measurable number of times during a given period; (3) the payments approach, which relates payments to receipts in the Keynesian manner, without the use of the "multiplier" concept which Hart regards as an "analytical fifth wheel"; and (4) the cash-balance approach, following the Cambridge tradition of relating stock of money to national income. Part II will be helpful to research workers as a "refresher course" and in understanding the concepts and terminology used in modern monetary discussions.

A detailed factual review of fluctuations in prices and employment and their relationships to monetary fluctuations is found in Part III. The author has no illusions about "proving" theories with empirical data. Nor does he have much faith in "poring over charts and tables." "The notion that 'the facts will tell their own story' and shape themselves into 'patterns' which explain everything is just a branch of numerology. . . . Statistical measurements are useful only in conjunction with sensible theories. . . . What they can do is only to *reject* hypotheses with which they are not consistent." But he finds considerable evidence to support the hypothesis that fluctuations in prices and employment are related to monetary fluctuations.

In part IV, concerned with international monetary relations, the development follows more conventional textbook lines. But the general tone of Part V evidences Hart's great interest in policy questions, particularly questions of objectives, guides, and weapons of economic stabilization. In a sense, the purpose of everything before is to prepare the student for this discussion. Hart concentrates on monetary and fiscal policies, but does not ignore those that fall largely outside these fields—labor relations, anti-monopoly policy, etc. He favors automatic stabilization devices that are built into the framework of the economy, because they avoid "bossism." He has kind words for Graham's "Commodity Reserve Currency," partly because of its automatic features. But he recognizes the need for discretionary controls. He argues convincingly for income-tax flexibility as an added stabilization device.

In an undertaking of such scope and proportions, criticism can of course be made on specific points. Restriction of the term "money" to coin and paper money, with checking accounts designated "near-money," does not seem to add anything *net* to the clarity of the exposition. Some will question putting the automatic gold standard and "Social Credit" under the same heading as monetary panaceas. On these and other points, students are likely to differ with Hart. But they will benefit both from his clarity of exposition and from the challenging way in which he evaluates the several proposals for economic stabilization.

*Donald C. Horton*

*Agricultural Economics.* By Benjamin Horace Hibbard. McGraw-Hill Company, New York. 433 pages. 1948.

THE PAGE preceding the preface carries this simple dedicatory line: "To my graduate students, 1913 to 1940." I, like a great many in the agricultural world of today, was one of Professor Hibbard's graduate students. All of us had and continue to have a deep filial affection for him.

As the years roll by we are able to reflect on the influences in the world of agricultural economics that grew out of Professor Hibbard's teaching at the University of Wisconsin. He was not the kind of professor who taught a doctrine and expected the students to remember everything that was in his lectures or the textbook. Rather, he was a leader in thought who developed a philosophic understanding of the economic phenomena in agriculture. He was a humanist in the sense that human welfare and human behavior were always of foremost interest to him. His teaching at the University of Wisconsin began in 1913, but Professor Hibbard had been head of the economics department at Iowa State College for 10 years before coming to Wisconsin. Out of his rich teaching experience and work with graduate students at Wisconsin he has produced this book.

All of his graduate students are familiar with Professor Hibbard's lectures and discussions in his basic course, the "Premises of Agricultural Economics." The outline of the book follows the type of subjects which made up the topics of that course. One would of necessity pick out the topics of the most important generalizations and associate them with economic principles that are involved in their interpretation and analysis. After discussing what agricultural economics is he moves over to the motivations which cause men to take up farming. He deals with the factors involved in the types and sizes of farms and farm management; the composition of rural populations. He draws on economic theory in the chapters, "Proportioning the Factors of Production," and "Intensity of Cultivation." Wages and rent get effective treatment.

Remembering his definitive "History of Public Land Policies in the United States" it seems natural that five chapters should be given to land economics and landlord and tenant relationships. Farm credit and marketing are given meticulous treatment.

Professor Hibbard's former students will enjoy reading "Ups and Downs of the Tariff." This reviewer wishes that at least this chapter could have been presented verbatim as it was covered in Benny Hibbard's lecture days.

Because of Professor Hibbard's special interest and competence in the subject, he has included chapters that deal with the stories of the six farm organizations—the Grange, the Farmers' Alliance, the Society of Equity, the Farmers Union, the Non-Partisan League, and the Farm Bureau.

Professor Hibbard has not burdened his book with statistical tables or quantitative analyses that often pass into history by the time the ink is dry. He has kept out quantitative data and discussion that involved theoretical points which would have greatly expanded the scope of the book, thereby limiting the readership and wide use which it deserves and will undoubtedly get by farmers and the general readers. His graduate students know that Professor Hibbard was not only a great and stimulating teacher, but also one who left a deep impression on the student's mind and in his heart. Many who took his course in the Premises of Agricultural Economics have wished then, and wish now, that they could have complete notes that embody both the outline and philosophies of the lectures. They will find them in this book which is destined to have great value as a general text book in agricultural economics, and as a source and reference book in the library and on the shelves of the individual connected with varied fields of modern agriculture. I recently showed a copy to a man who, as an undergraduate, took Professor Hibbard's course; upon reading it he remarked that the book was Professor Hibbard's course through and through and that he would get a copy for his personal reference library.

*M. L. Wilson*

*The Economics of Agriculture.* By R. L. Cohen. Introduction by C. W. Guillebaud. Pittman Publishing Corporation, New York and London. 202 pages. (Cambridge Economic Handbooks—10)

HOSE who believe a brief, elementary book dealing with the economics of agriculture some day can be written may draw hope from this book. Economists interested in securing a general view of the field or teaching a first-year course in economics of agriculture, should find it a valuable aid. It was published in 1940 as part of the distinguished series of Cambridge Economic Handbooks and is now issued for the first time by an American publisher. Other books in the series include *Money* by D. H. Robertson, *Supply and Demand* by Henderson, and *The Structure of Competitive Industry* by E. A. G. Robinson.

*The Economics of Agriculture* represents an application of the tools of economic theory to agriculture. ". . . it assumes some knowledge of economic principles . . . It is concerned, to a large extent, to point out differences between the economics of agriculture and those of industry." It is divided into three sections: (1) The statics of agricultural economics including an analysis of farm production, farm size, and the organization of marketing, (2) dynamics of agriculture, including the reaction of supply and demand, trends in earnings, and the instability of agriculture, and (3) reasons for and economic consequences of State intervention.

The emphasis on dynamics and the discussion of the role of the State lend interest and give desirable balance. The chapter on size of farms is noteworthy in presenting a well-rounded discussion infrequently found in textbooks on farm management or agricultural economics.

A defect of the book lies in its failure to develop the principle of variable proportions. Diminishing returns are explained in Ricardian terms: "It is because of this cooperation between nature and man—that the more intensive cultivation of the soil leads to diminishing returns." This setting up of diminishing returns as a metaphysical law of agriculture rather than a general principle of production leads to confusion in this and some of the later chapters. For example, in Chapter 6 agriculture is separated from other industries because expansion in agricultural output will mean diminishing returns, whereas in other industries increasing returns are likely to prevail. In the United States, of course, because of technological advance, both agriculture and industry have lowered rather than raised costs per unit with increased output. In the absence of technological changes, any industry that is operating under competitive conditions would be expected to evidence diminishing returns as output increases.

Miss Cohen presents a rather comprehensive analysis of supply curve but does not develop comparable analysis of demand curve for agricultural products. Many will feel that the attention devoted to the marketing and consumption of agricultural products is insufficient.

This reviewer would question certain uses of terminology. In the introductory chapter Miss Cohen says that "little attention is paid to problems of farm management." This implies a much narrower definition of farm management than is now generally accepted in the United States. Farm management is commonly accepted as paralleling that sector of economics dealing with the theory of the firm or the principles of production, including both the individual and the aggregative aspects. Then the use of the term, government interference, as a synonym for government intervention has unfortunate connotations in the American vocabulary.

Despite these limitations, in this reviewer's opinion, the book is a good concise introduction to the economics of agriculture. It attempts at all stages to apply the techniques of economic analysis. By emphasizing the dynamic as well as the static aspects and discussing the role of the State, it gives the broad comprehensive view of the field which is so desirable in an elementary book on the subject. Most agricultural economists probably will find it an interesting and profitable review of the basic principles of economics applied to agriculture.

*Kenneth L. Bachman*

# Selected Recent Research Publications in Agricultural Economics Issued by the Bureau of Agricultural Economics and Cooperatively by the State Colleges [1]

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. FARM INCOME IN 1948: FARM DEBTS AND BALANCE SHEET FOR JANUARY 1, 1949. 5 pp. Feb. 10, 1949. (Press release.)

For the first time, in this release, farm income is balanced against farm debt and comparisons are made with the balance sheet of agriculture. In 1948, for the first time in 10 years, farm operators' realized net income went down.

ANDERSON, A. H., and VERGERONT, GLEN V. RURAL COMMUNITIES AND ORGANIZATIONS. A STUDY OF GROUP LIFE IN WELLS COUNTY, NORTH DAKOTA. N. Dak. Agr. Expt. Sta. Bul. 351, 80 pp., illus. June 1948. [Printed.]

One of a series of studies made in counties selected to represent major types-of-farming areas in the United States. Purpose is to analyze types of groups in which rural people are organized and patterns of group relationships through which they take part in programs and services, local and otherwise; to analyze ways in which agencies relate themselves and their programs to these types and patterns; and to compare, by types-of-farming areas, trends in different types of organizations. (BAE cooperating.)

BLACKMORE, W. EDWARD. FARM-TO-RETAIL MARGINS FOR WHITE FLOUR AND WHITE BREAD. 16 pp., illus. Bur. Agr. Econ. Dec. 1948.

Failure of retail price of bread to respond to rapid fall in price of wheat, Jan.-Oct. 1948, intensified interest of farmers and consumers in cost of marketing certain basic farm products and emphasized the record high cost of food. Report describes some conditions respecting spread between price farmers receive for wheat and price consumers pay for product in usable form.

DELOACH, D. B. OUTLOOK FOR HOPS FROM THE PACIFIC COAST. 40 pp., illus. Bur. Agr. Econ. Nov. 1948.

Brings to date the "Outlook for Hops" issued in 1946 by the BAE and Agr. Expt. Stations of Calif., Oreg., and Wash. Outlook for hops in relation to production, consumption, foreign trade, and prices.

FERRIER, W. T., MALPHRUS, L. D., GARRISON, O. B., GRITZAN, R. F., and ROBERT, S. A., JR. MARKETING SOUTH CAROLINA TOMATOES IN NEW YORK CITY (COSTS AND MARGINS). S. C. Agr. Expt. Sta. Cir. 73, 14 pp., illus. Dec. 1948. [Printed].

Intended to disclose price margins in effect and services rendered by handlers and service agencies in marketing South Carolina tomatoes; to relate these services to cost of performing them; and to survey problems that need further investigation. (A report under the Research and Marketing Act; BAE cooperating.)

HOCHMUTH, H. R., and GOODSELL, WYLIE D. COMMERCIAL FAMILY-OPERATED CATTLE RANCHES, INTERMOUNTAIN REGION, 1930–47, ORGANIZATION, COSTS, AND RETURNS. 29 pp., illus. Bur. Agr. Econ. Nov. 1948.

Statistical summary of adjustments and changes in organization of these ranches, investment, income, and expense. Part of a Nation-wide study of commercial farms and ranches by types and sizes in important farming regions.

MARX, ROBERT E. ECONOMICS OF ALFALFA SEED PRODUCTION IN KANSAS. Kans. Agr. Expt. Sta., Dept. Agr. Econ. Agr. Econ. Rept. 36, 32 pp., illus. Oct. 1948.

In Kansas, production of alfalfa seed complements production of alfalfa hay. The seed is valuable in the farm business as usually it is best when hay production is relatively poor.

NORTH CENTRAL LIVESTOCK MARKETING RESEARCH COMMITTEE. PRICE DIFFERENTIALS FOR SLAUGHTER HOGS. Iowa Agr. Expt. Sta. Bul. P 93, pp. 58–128, illus. Aug. 1948. [Printed.]

Presents information on price relationships for hogs between markets and between weight classifications, and explains factors that influence differentials. (BAE and Expt. Stations of Ill., Ind., Kans., Ky., Mich., Minn., Mo., Nebr., Ohio, Okla., and S. Dak. cooperating.)

SUTHERLAND, J. GWYN, and JAMES, H. BROOKS. MECHANICAL HARVESTING OF COTTON IN NORTH CAROLINA, 1947. N. C. Agr. Expt. Sta., Dept. Agr. Econ., AE Info. Ser. 20, 28 pp. Dec. 1948.

A preliminary progress report. Part of larger study of mechanization of cotton and its implications in North Carolina; supported in part by funds under RMA. (BAE cooperating.)

TOSTLEBE, A. S., GARLOCK, F. L., BURROUGHS, R. J. AND OTHERS, UNDER THE DIRECTION OF NORMAN J. WALL. THE BALANCE SHEET OF AGRICULTURE, 1948. U. S. Dept. Agr. Misc. Pub. 672, 38 pp., illus. 1948. [Printed.]

An annual report designed to carry forward the comparative balance sheet of agriculture since 1940. A balance sheet of the agricultural industry as one large enterprise.

WISCONSIN AGRICULTURAL EXPERIMENT STATION. WHAT MAKES THE MARKET FOR DAIRY PRODUCTS? Wis. Agr. Expt. Sta. Bul. 477, 59 pp., illus. Sept. 1948. (North Central Regional Pub. No. 10.) [Printed.]

[1] Printed reports are indicated as such. All others are processed. State publications may be obtained from the issuing agencies of the respective States.



U. S. GOVERNMENT PRINTING OFFICE: 1949

Chief purpose is to contribute to understanding of factors affecting demand for dairy products by summarizing facts and evaluating present and proposed policies of industry and government relating to consumption and demand for the products. (BAE and Agr. Expt. Stations of Conn., Del., Ill., Ind., Iowa, Kans., Ky., Maine, Md., Mass., Mich., Minn., Mo., Nebr., N. H., N. J., N. Y., N. Dak., Ohio, Pa., R. I., S. Dak., Vt., W. Va., and Wis. cooperating.)

## Statistical Compilations

PALMER, CARY D., SCHLOTZHAUER, E. O., and KIESLER, P. F., UNDER THE GENERAL DIRECTION OF R. ROYSTON. FRUITS AND NUTS; BEARING ACREAGES, 1919–46. 39 pp., illus. Bur. Agr. Econ. Jan. 1949. (CS–32)

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. FEED STATISTICS, INCLUDING WHEAT AND RYE. 44 pp. Dec. 1948.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. MILK PRODUCTION ON FARMS AND STATISTICS OF DAIRY PLANT PRODUCTS, 1948. 28 pp. Feb. 1949.

John L. Wilson, Frank M. Taylor, D. H. Foster, W. D. Bormuth, I. E. Wissinger, R. P. Matteson, and P. E. O'Donnell prepared the series, under direction of B. H. Bennett.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. PRODUCTION, FARM DISPOSITION AND VALUE, PRINCIPAL FRUITS AND TREE NUTS, 1947–1948 SEASONS (INCLUDES REVISIONS FOR 1946 GRAPES AND PRUNES). 24 pp. Jan. 1949.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. PRODUCTION OF MANUFACTURED DAIRY PRODUCTS, 1947. 34 pp. Dec. 1948.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. RATIONS FED TO MILK COWS, 1948. 24 pp. Jan. 1949.

WEEKS, SILAS B. FARM EQUIPMENT, 1948, COSTS AND PERFORMANCE RATES, SOUTHERN NEW ENGLAND. Univ. Conn. Agr. Ext. Serv. 9 pp. Feb. 1949. (BAE cooperating.)

AGRICULTURAL ECONOMICS
RESEARCH

Is published quarterly by the Bureau of Agricultural Economics, U. S. Department of Agriculture. The printing of this publication was approved by the Director of the Bureau of the Budget, November 6, 1946.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 20 cents a single copy, 75 cents a year, domestic, $1 foreign.